



**ENGINEERING EVALUATION AND COST ANALYSIS
FOR
REMOVAL ACTION ON BUILDINGS AND EQUIPMENT
AT THE
WESTINGHOUSE FORMER FUEL CYCLE FACILITY SITE
FESTUS, MO**

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ACRONYMS

ABB	Asea Brown Boveri
AEC	Atomic Energy Commission
ALARA	As low as reasonably achievable
ARAR	Applicable or Relevant and Appropriate Requirements
BEIR	Committee on the Biological Effects of Ionizing Radiation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	U.S. Code of Federal Regulations
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
FFCF	Former Fuel Cycle Facility
HASP	Health and Safety Plan
HEU	High-enriched uranium
ICRP	International Commission on Radiological Protection
MDNR	Missouri Department of Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCRP	National Council on Radiation Protection
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
SARA	Superfund Amendments and Reauthorization Act
TBC	To Be Considered
UF ₆	Uranium hexafluoride

EXECUTIVE SUMMARY

Westinghouse Electric Company LLC (Westinghouse) has prepared this Engineering Evaluation/Cost Analysis (EE/CA) to evaluate potential removal action alternatives for buildings and equipment at the Hematite Former Fuel Cycle Facility (FFCF) that are radioactively contaminated or interfere with the characterization and future remediation, if necessary, of impacted soil and/or groundwater beneath the buildings. The impacted buildings and equipment historically have been used for the production of nuclear fuels from natural, depleted, and enriched uranium. More than 45 years of processing nuclear materials have resulted in uranium contamination of building and equipment surfaces. A Historical Site Assessment (HSA) (Ref. 1) completed in 2003 identified site areas where radioactive contamination is known to exist or potentially exist. Characterization efforts to date have confirmed the presence of uranium-238, -235, and -234 contamination on interior building and equipment surfaces. In addition, limited characterization efforts to date have identified impacts and potential impacts to soil and groundwater beneath the buildings that will require additional characterization and possible remediation in the future. Uranium-238, -235, and -234 and technetium-99 contamination has been detected in the soil underneath some of the buildings.

The FFCF site is located in eastern Missouri in Jefferson County near the town of Hematite. The site fronts the eastbound lane of Missouri State Road P, between hills to the northwest and a terrace/floodplain of Joachim Creek to the southeast. The topography slopes gently to the southeast eventually blending with the alluvial floodplain deposits of Joachim Creek, which runs along the southeastern edge of the site property and flows into the Mississippi River.

The result of the EE/CA process provides a recommendation for removal action based on the evaluation of alternatives considered. Preparation of this EE/CA fulfills the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Ref. 2) and National Contingency Plan (NCP) (Ref. 3) requirements for documentation of the removal action selection process. The goal of this EE/CA is to develop a removal action alternative for contaminated buildings and associated equipment that is 1) protective of public health, the environment, and site workers, 2) eliminates interference for characterization and future remediation, if necessary, of impacted soil and/or groundwater beneath the buildings, 3) provides for stakeholder involvement, and 4) achieves risk reduction at the FFCF without unnecessary delay.

This EE/CA provides the results of the evaluation of three removal action alternatives regarding the final disposition of radioactively contaminated buildings and equipment at the FFCF site. Westinghouse developed the removal action alternatives after evaluating applicable technologies capable of protecting public health, site workers, and the environment. The evaluated alternatives include the following:

- Alternative 1: No action with engineering controls
- Alternative 2: Equipment removal and building decontamination

- Alternative 3: Equipment removal and building demolition

Consistent with the protocols established by the U.S. Environmental Protection Agency (EPA) under the NCP, all three alternatives were evaluated with respect to effectiveness, ability to implement, cost, and other relevant factors. After a thorough evaluation of all relevant factors, Alternative 3 is the preferred alternative because it represents the most cost effective remedy that is protective of public health, site workers, and the environment.

1.0 INTRODUCTION

Westinghouse Electric Company LLC (Westinghouse) has prepared this Engineering Evaluation/Cost Analysis (EE/CA) to evaluate potential removal action alternatives for radioactively contaminated buildings and equipment at the Hematite Former Fuel Cycle Facility (FFCF). The potential removal action at the FFCF is necessary to address the potential threat that radioactively contaminated buildings and equipment pose to public health, site workers, and the environment. The removal action will be conducted consistent with: (1) the National Contingency Plan (NCP), 40 CFR §§ 300.1 *et seq.* (Ref. 3), and related guidance; (2) site decommissioning activities under Nuclear Regulatory Commission (NRC) License No. SMN-33; (3) the Hematite Decommissioning Plan (Ref. 4); and (4) oversight by the NRC and the Missouri Department of Natural Resources (MDNR).

2.0 SITE CHARACTERIZATION

Site characterization provides information on the site description and background; previous removal actions; the source, nature, and extent of contamination; analytical data; site conditions justifying a removal action; and a streamlined risk evaluation.

2.1 Site Description and Background

The FFCF site is located in eastern Missouri in Jefferson County near the town of Hematite. It fronts the eastbound lane of Missouri State Road P, between the hills to the northwest and a terrace/floodplain of Joachim Creek to the southeast. The topography slopes gently to the southeast eventually blending with the alluvial floodplain deposits of the Joachim Creek, which runs along the southeastern edge of the site property and flows into the Mississippi River. A map showing the site's general location and surrounding features is provided in Appendix A.

The area surrounding the site is mainly suburban residential. Within four miles of the site, groundwater is widely used as a source for household water. More than 11,000 people are served by public wells in the area, and nearly 1,000 are served by private wells.

The FFCF is privately owned by Westinghouse and was acquired from Asea Brown Boveri (ABB) in April 2000. The facility has been commercially owned and operated since manufacturing operations began in 1956. The U.S. Department of Energy (DOE) and its predecessors were the primary customers of the facility between 1956 and 1974. There are currently no manufacturing operations being performed at the site.

Primary functions at the site throughout its history have included the manufacture of uranium compounds from natural and enriched uranium for use as nuclear fuel. Specifically, operations included the conversion of uranium hexafluoride gas of various

uranium-235 enrichments to uranium oxide, uranium carbide, and uranium dioxide. These products were manufactured for use by the federal government and government contractors and by commercial and research reactors approved by the Atomic Energy Commission (AEC). Research and development was also conducted at the site, as were uranium scrap recovery processes.

Buildings used for the nuclear fuel manufacturing process and other support buildings are located on an approximately ten-acre central site tract as shown in Appendix A. The majority of the buildings are constructed of concrete block, but some are constructed of wood and others of steel with concrete floors. Table 2-1 provides a list of the buildings currently on the site and a short description of the materials from which they were constructed.

Table 2-1
Hematite Buildings Construction

Building	Foundation	Walls	Roof
Building 101	Reinforced concrete	Tile/wood/concrete block	Metal
Building 110	Reinforced concrete	Brick	Flat tar
Building 115	Reinforced concrete	Brick/concrete block	Flat tar
Building 120	Soil	Wood	Metal
Building 230	Reinforced concrete	Metal siding	Flat metal
Building 231	Reinforced concrete	Metal siding	Flat metal
Building 235	Reinforced concrete	Concrete block	Flat metal
Building 240	Reinforced concrete	Concrete block	Flat metal
Building 245	Reinforced concrete	Concrete block	Flat metal
Building 252	Reinforced concrete	Concrete block	Flat metal
Building 253	Reinforced concrete	Concrete block	Flat metal
Building 254	Reinforced concrete	Metal siding	Flat metal
Building 255	Reinforced concrete	Concrete block	Flat metal
Building 256	Reinforced concrete	Concrete block	Flat metal
Building 260	Reinforced concrete	Concrete block	Flat metal
Building 261	Reinforced concrete	Metal siding	Flat metal

2.2 Previous Removal Actions

A number of previous investigations have been conducted at the FFCF relating to both on-site and off-site impacts. Specifically, in 2002, Westinghouse, in conjunction with MDNR, determined that a time-critical removal action was appropriate to mitigate potential risks associated with groundwater impacts in the vicinity of the FFCF. Westinghouse prepared an Action Memorandum to document its response (bottled water, filtration units, as needed, and additional investigation) and to address the potential risk associated with the groundwater impacts. This Action Memorandum was subsequently approved by MDNR and implemented. As a follow-up to this response action, Westinghouse submitted an EE/CA to MDNR in January 2003. The evaluation of groundwater conditions and potential alternatives to address these conditions was conducted as a non-time-critical removal action in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC § 9601 *et seq.*, (Ref. 2) and the NCP and resulted in an extension of the existing public water supply to residents in the vicinity of the FFCF. These removal action documents are available in the information repository established for the FFCF.

In addition, to facilitate current and future response activities at the FFCF in general and in connection with the buildings and equipment in particular, Westinghouse has preformed the following in or around site buildings:

- All of the material and staged equipment have been removed from Building 120 (Wood Barn), packaged in sealand containers, and relocated within the security fence.
- Both the wet and dry scrubbers that were located outside on the northeast side of the building complex have been removed and shipped off site for disposal.
- The incinerator has been removed from Building 240-3 (Green Room) and shipped off site to a buyer.
- Other miscellaneous material and equipment have been removed from site buildings and shipped to other locations for reuse.
- Characterization surveys were performed in the main process buildings in June 2004 to measure the amount of loose contamination on building and equipment surfaces. This work is described in Section 2.4.1.
- Soil samples were collected from locations beneath building foundations during a site characterization effort in 2003. This work is described in Section 2.4.2.

The equipment removal activities identified above were performed following plant shutdown to facilitate underlying soil and groundwater characterization and to begin the

process of removing contaminated equipment that is a risk to human health and the environment.

2.3 Source, Nature, and Extent of Contamination

More than 45 years of processing nuclear materials have resulted in uranium-238, -235, and -234 contamination of process building surfaces and accompanying equipment. Evidence of widespread loose contamination in the main process buildings can be seen in the results of characterization surveys conducted in these buildings in June 2004. Smears were used to measure loose (i.e., removable) alpha and beta/gamma contamination levels on building and equipment surfaces. The results of these surveys are discussed in Section 2.4.1.

During a characterization effort in 2003, soil samples were collected from beneath the foundations of several process buildings. Uranium-238, -235, and -234 and technetium-99 contamination was detected in the soil underneath these buildings. The results of this characterization are presented in Section 2.4.2. These samples provide definitive evidence of radioactive contamination under some of the site buildings and demonstrate the need to better characterize the soil impacts underneath all the buildings. One of the radioactive contaminants identified in two of the samples is technetium-99. The groundwater in the site overburden also has historical contamination of technetium-99. A field investigation performed in 1996 indicated that the technetium-99 entered the groundwater system from the soil in the vicinity of an outside storage area and traveled down-gradient toward nearby monitoring wells. This demonstrates the potential for radioactive contaminants in the soil to spread and enter the groundwater system.

Some of the buildings described below have no known radioactive contamination above the level for unrestricted use but do present an interference to the characterization and future remediation, if necessary, of contaminated soil and groundwater that likely exist underneath these buildings. Because they are an interference to characterization and remediation, if necessary, of underlying soil and groundwater, all of these buildings are candidates for demolition. Two of the buildings that are acceptable for unrestricted use, Buildings 110 and 230, have potential future use for the eventual owner of the site. As a result, Westinghouse plans to leave these two buildings in place with the understanding that, based upon future characterization of soil and groundwater surrounding these buildings, demolition of these buildings may be necessary in the future.

Several of the buildings contain process equipment. Because this equipment is contaminated and poses a threat to human health and the environment, it will be removed for disposal or recycling at a permitted facility. Removal is necessary because decontamination of equipment is labor intensive and often ineffective. Decontamination places workers at increased risk of exposure to radioactivity and is not consistent with ALARA principles, given that cost-effective disposal options are readily available.

Information on building use, building and underlying soil contamination, and major process equipment present in the building is provided, as applicable, in the following.

Building 101 – Tile Barn

This structure was part of the dairy farm that operated on the property prior to the purchase of the land for the construction of the FFCF. The Tile Barn formerly functioned as the emergency operations center. The building has been used to store both clean and radioactively contaminated equipment. During the construction of the emergency operations center, residual contamination was detected at low concentrations in this building. Soil adjacent to the Tile Barn is known to have surface or near surface uranium contamination. An area adjacent to the building was used to store excess contaminated equipment. The Cistern Burn Pit near the Tile Barn was used historically to burn contaminated wood and pallets. A Gamma Walkover Survey (GWS) described in the “Gamma Survey Data Evaluation Report” (Ref. 5) was performed at the Hematite site in 2003 to identify the presence of uranium, technetium, and thorium contamination in surface or near-surface soils. The GWS detected several areas of elevated gamma radiation in the soil around the Tile Barn. Because of this evidence of radioactive contamination in the soil around the building, there is a high potential for soil contamination underneath Building 101. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Building 110 – Office Building

Building 110 is the pedestrian entrance into the plant. The building currently has a security station at the entrance and several offices, a conference room, and a kitchen. No work with radioactive or chemical compounds occurred in or around this building. Additional characterization is required to confirm the presence or absence of contamination in the building in addition to soil contamination around or underneath the building. Because the building has potential future use for the eventual owner of the site, Westinghouse will leave it in place if it does not pose an interference to additional characterization and future remediation, if necessary, of underlying soil and groundwater.

Building 115 – Generator/Fire Pump Building

A diesel-powered emergency generator was located in this building. A diesel-powered firewater pump currently remains in the building. There is no evidence that work with radioactive materials was performed in or around this building. Additional characterization is required to confirm the presence or absence of soil contamination around or underneath the building.

Building 120 – Wood Barn

This building also was part of the dairy farm that operated on the property. The building was used to store both clean and contaminated equipment. All of this equipment has been removed from the building. The Wood Barn has a dirt floor, which contains residual contamination in low concentrations. The GWS detected areas of elevated gamma radiation in the soil near the Wood Barn. Because of this evidence of radioactive

contamination in the dirt floor and the soil around the building, there is a high potential for soil contamination underneath Building 120. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Building 230 – Rod Loading

Building 230 was built in 1992 to receive finished pellets (standard, erbium, and gadolinium), which were then loaded into fuel rods and assemblies for shipment off-site. No appreciable amounts of chemicals were used in this building, and contact with fuel pellets was limited to two small areas. The building is currently being used as office space. The building surfaces and equipment have no known levels of contamination above the level for unrestricted use. Additional characterization is required to confirm the presence or absence of contamination within the building in addition to soil contamination around or underneath the building. Because the building has potential future use for the eventual owner of the site, Westinghouse will leave it in place if it does not pose an interference to additional characterization and future remediation, if necessary, of underlying soil and groundwater.

Building 231 – Warehouse

Building 231 was used to store shipping containers. Some shipping container refurbishment was performed in this building. Recent surveys did not detect the presence of radioactive contamination in the building. Additional characterization is required to confirm the presence or absence of soil contamination around or underneath the building.

Building 235 – West Vault

The West Vault was most recently used to store depleted and natural uranium. It was historically used to store high-enriched uranium (HEU). The interior of the building was painted in 1994, and contamination might be present under the paint. Additional characterization is required to confirm the presence or absence of soil contamination around or underneath the building.

Building 240 – Recycle Recovery (Red Room, Green Room, Blue Room)

This building contained laboratory and maintenance areas, a recycle recovery area, a waste incinerator area, and a health physics laboratory. Support operations were conducted for conversion, pelletizing, and fuel assembly, including material recycle, scrap recovery, cylinder heel recovery, quality control, analytical laboratory, maintenance, waste consolidation, and disposal preparation. This building was integral to the historic operations of the facility. Past operations included the conversion of HEU using a wet conversion process and wet recovery of scrap. The effluent streams were piped to on-site retention ponds for settling and evaporation. The piping system is likely to contain HEU. Numerous spills and leaks likely occurred in these areas, and parts of the slab were re-poured in 1974 over some existing contaminated flooring. The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

Additionally, sub-slab contamination was found during the 1989 construction of Building 253. Also, the soil sampling beneath the buildings described in Section 2.4.2 identified radioactive contamination underneath Building 240. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Building 240 was initially divided into numbered rooms. Some of these rooms were also given a color designation.

Building 240-1 formerly housed the health physics and production laboratories, lunchroom, and laundry for radioactively contaminated personal protective equipment. It historically housed the lunchroom, offices, locker rooms, and laundry. The only current use for this section of the building is personal protective equipment and material storage.

Building 240-2 (Red Room) was used for recycle and recovery operations. It historically included high-enriched material operations, including recycle and recovery.

Building 240-3 (Green Room) was formerly used for the incinerator and associated support operations. The incinerator has been removed. The room historically housed low-enriched powder operations, including ammonium diuranate and oxidation/reduction furnaces. The room is currently used for storage and waste staging.

Building 240-4 (Blue Room) formerly housed the maintenance shop. It also housed the low-enriched powder operations and the production laboratory until 1993, when the laboratory was moved to Building 240-1. The room currently contains some miscellaneous equipment.

Process equipment currently in Building 240 includes:

- Recycle furnaces (3)
- Furnace controllers (2)
- Reactor box coolers (3)
- Scrubbers (3)
- Filtrate tanks (2)
- KOH tank
- Water tanks (2)
- Reactor boxes (9)
- Reactor box load/unload hood
- Filter compactor
- Ventilation hoods (3)
- Drying furnaces (2)
- Filter shredder
- MCO hood/scale
- Secondary precipitation tank/press
- Milling hood
- Utility hood
- Dissolver/loading hood
- NOX scrubber/pump/column
- 12 x 12 press (2)
- 8 x 8 press
- Clarity columns (2)
- Urinal nitrate tank
- UO₄ dryer/unload hood
- Precipitation trough/overflow vessels
- UO₄ dry scrubber

- Gamma counter
- Incinerator transformer
- Ammonium hydroxide tank
- Centrifuge/overflow vessel
- Miscellaneous support equipment

Building 245 – Well House

The Well House is a block building attached to the potable water tank by the double doors into the laundry room. Currently, chlorinating of potable water occurs in the building using sodium hypochlorite (bleach), and the tank marked "potable water" is used to ensure appropriate contact time. This building and the attached tank are connected to a 200,000-gallon gravity tank on the hill across State Road P.

Formerly, the existing chlorine contact tank was used as a pressure tank to create the static head by adding nitrogen as necessary. That operation ended when the gravity tank was built in 1991. The Well House formerly contained a mop water boil-down tank immediately east of the chlorinating tank with a storm drain under the tank for overflow. The boil-down tank was eliminated around 1993, and the storm drain was capped with concrete.

Because of its close proximity to process buildings with underlying soil contamination, there is a high potential for soil contamination underneath Building 245. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Building 252 – South Vault

The South Vault is a reinforced concrete structure with six bays. The South Vault was used for storage of low- and high-enriched nuclear material. Because of the traffic in and out of the building, it is likely that the floor is contaminated. The building was most recently used for storage of chemicals and low-level radioactive wastes.

Because of its close proximity to process buildings with underlying soil contamination, there is a high potential for soil contamination underneath Building 252. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Building 253 – Offices, Storage, and Mechanical Operations

This building contained offices, various site utilities, a uranium storage facility, processing areas, and decontamination facilities. Within Building 253 is Building 250, which was formerly a stand-alone structure. In 1958, rooms 250-2 and 250-3 were added to Building 250. Building 250 became room 250-1 and continued to be used for the storage of uranium hexafluoride (UF₆) cylinders and mechanical operations such as boilers, cooling tower pumps, and recycle hopper make-up. Building 250-2 was used as a general storage area, and Building 250-3 was the blending room for low-enriched uranium oxide. The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

The soil sampling beneath the buildings described in Section 2.4.2 identified radioactive contamination underneath Building 253. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Process equipment currently in Building 253 includes:

- Recycle hopper hood
- Electric hoist/hopper tumbler
- Recycle hoppers (3)
- Cylinder wash columns
- Cylinder rotation assembly
- Ammonium bicarbonate tank
- Peroxide carboy
- Nitric carboy
- Carboy dike
- 500-gallon hydrostatic test tank
- Miscellaneous support equipment

Building 254 – Pellet Plant

In this building, granules of uranium dioxide (UO_2) or uranium oxide (U_3O_8) were fed into a mill (micronizer) that produced fine powder for pressing. A starch and die lubricant was added, and the mixture was blended into a batch and pressed into pellets. The "green" fuel pellets were processed through a de-waxing furnace to remove the additives and then passed through a sintering furnace where they were made into a ceramic. These furnaces were electrically heated and used disassociated ammonia to provide a reducing atmosphere. The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

Because of its close proximity to the other process buildings, there is a high potential for soil contamination underneath Building 254. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Process equipment currently in Building 254 includes:

- Micronized power blenders (6)
- Unload columns and star valves (6)
- De-waxing furnaces (2)
- Oxidation furnaces (2)
- Sinter furnaces (2)
- Pellet milling hoods (2)
- Recycle hopper hoods (2)
- Virgin hopper hoods (2)
- Micronizers and hoods (2)
- PLC units (2)
- Vacuum fines vessels (6)
- Filter pots and hoods (6)
- Powder screw buffers (3)
- Can elevators (2)
- Press hood filter housings (4)
- Oxidation load hoods (2)
- Oxidation unload hoods (2)
- Grinder bowl drying furnaces (3)
- Brew furnace
- Utility hoods (3)
- MCO hood/scale
- Drying furnace/conveyor
- Pie unit
- Laser mike grinder conveyor
- Grinder entrance hood
- Centrifuge hoods (2)

- Powder screw buffer with unload hood
- Large air tank for blending
- Granulators (2)
- Nauta mixers (4)
- Acra-wax hood
- Poreformer hood
- Powder transfer vessels/hoods (2)
- Powder transfer units/filter pots (6)
- Density grinder
- Tennent floor scrubber
- Vacuum transfer blowers (3)
- Motor control centers (2)
- Parts washer
- Numerous parts and shelves
- Miscellaneous support equipment

Building 255 – Erbia Plant

The most recent use of this building was for the special product line making erbium pellets. It was the main pellet plant from 1974 through the opening of Building 254 in 1989. This process area included agglomeration, which used Cranko and Freon instead of the slugging presses, to increase particle size between the micronization/blending and pellet pressing. Building 255-3 was historically called the Item Plant because the work that was carried out in this room was classified. Products fabricated in this room were referred to as “Items.” The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

The soil sampling beneath the buildings described in Section 2.4.2 identified radioactive contamination underneath Building 255. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Process equipment currently in Building 255 includes:

- Ventilation hoods (16)
- Can conveyor assemblies (2)
- Can elevators (3)
- Vacuum fines vessels (3)
- Slugging press
- Recycle hopper crane
- Tumbler assembly
- Grinder unit
- Centrifuge
- Pam unit
- Pie unit
- Kardex scale
- Kardex pan conveyors
- P22 shelving units
- Reactor box cooler
- Load/unload hood
- Numerous parts and shelves
- Miscellaneous support equipment

Building 256 – Pellet Drying and Warehouse

Building 256-1 was originally used as warehouse space and was later used for pellet drying. Pellet trays were bated into pans, dried in an electric oven using disassociated ammonia as a cover gas, and either stored or transferred to Building 230.

Building 256-2 was the main site warehouse for shipping pellets and powder and for receiving site supplies. The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

During the construction of Building 256, a large area of soil contaminated with uranium was removed and stored on site in a pile that has become known as “Deul’s Mountain.” Because of the soil contamination found during construction and the building’s close proximity to the other process buildings, there is a high potential for soil contamination underneath Building 256. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Process equipment currently in Building 256 includes:

- Kardex unit
- Shredder unit
- Conveyors
- Miscellaneous support equipment

Building 260 – Oxide and Oxide Loading Dock

The Oxide Building was built in 1968 and is a four-story, Butler-type building. This building was used for the conversion of UF_6 gas of various enrichments into uranium oxide granules. The characterization surveys described in Section 2.4.1 indicate that building and equipment surfaces are contaminated.

The soil sampling beneath the buildings described in Section 2.4.2 identified radioactive contamination underneath Building 260. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Process equipment currently in Building 260 includes:

- Reactors chained to wall (4)
- Motor control centers (2)
- Five-ton overhead crane
- Pot filter/housing
- Filter bank housings (2)
- Seed hoppers (7)
- Ventilation hoods (5)
- SCR panels (2)
- Super heaters (3)
- Two-ton overhead crane
- Can elevator
- Seed hopper crane
- Virgin hoppers (44)
- Shelving unit with spare parts
- UF_6 scrubber
- Miscellaneous support equipment
- Chiller assembly and piping

Building 261 – Limestone Building

Building 261 was used for the storage of unused limestone. Historically, the building contained a limestone storage bin, conveyor system, preheat furnace, and a heat trace. All contents have been removed from this building.

Because of its close proximity to the other process buildings, there is a high potential for soil contamination underneath Building 261. As such, the building would interfere with further characterization and potential remediation of underlying soil and/or groundwater.

Table 2-2 summarizes key information for these site buildings.

EE/CA for Removal Action - Buildings and Equipment

Table 2-2
Site Buildings Summary

Building	Historical Use	Current Use	Uranium Process Equipment	Building or Equipment Contamination	Interference for Soil or Groundwater	Proposed Demolition
101	Emergency operations center	Storage	No	Yes	Likely	Yes
110	Office space	Office space	No	No	Unknown	TBD
115	Diesel generator/fire pump	Diesel fire pump	No	No	Unknown	TBD
120	Clean and contaminated equipment storage	None	No	Yes	Likely	Yes
230	Fuel rod loading	Office space	No	No	Unknown	TBD
231	Warehouse	Warehouse	No	No	Unknown	TBD
235	Uranium storage vault	None	No	Yes	Unknown	Yes
240	Uranium recycle and recovery, laboratories, maintenance shop, and laundry	Storage and waste staging	Yes	Yes	Yes	Yes
245	Potable water treatment	Potable water treatment	No	No	Likely	Yes

EE/CA for Removal Action - Buildings and Equipment

Building	Historical Use	Current Use	Uranium Process Equipment	Building or Equipment Contamination	Interference for Soil or Groundwater	Proposed Demolition
252	Uranium storage vault	Storage	No	Yes	Likely	Yes
253	Uranium storage and processing, site utilities, office space, and decontamination facility	None	Yes	Yes	Yes	Yes
254	Fuel pellet processing	None	Yes	Yes	Likely	Yes
255	Erbia fuel pellet processing and classified operations	None	Yes	Yes	Yes	Yes
256	Warehouse space and fuel pellet drying	None	Yes	Yes	Likely	Yes
260	Conversion of UF ₆ gas into uranium oxide	None	Yes	Yes	Yes	Yes
261	Storage of unused limestone	None	No	No	Likely	Yes

TBD - To be determined

2.4 Analytical Data

2.4.1 Buildings and Equipment

Characterization surveys were performed in six of the main process buildings (Buildings 240, 253, 254, 255, 256, and 260) in June 2004. Swipe surveys were taken on equipment and building surfaces to measure the amount of loose alpha and beta/gamma contamination. The actual survey measurements are provided in Appendix B.

2.4.2 Soil Beneath Buildings

Soil samples were collected from beneath building foundations during a site characterization effort in 2003. Bore hole and sampling locations were selected based on input from previous employees and historical knowledge of site operations to provide biased sampling locations most likely to be impacted by radioactive materials. The radiological results of the samples collected are presented in Table 2-3.

Table 2-3
Soil Samples Underneath Site Buildings

Sample ID	Units	Tc-99	U-234	U-235	U-238
BLD240-01-01	pCi/g			0.12	1.1
BLD240-01-09	pCi/g			0.23	0.9
BLD240-01-Fill	pCi/g			5.9	17
BLD240-03-04	pCi/g			0.44	1.32
BLD240-03-19	pCi/g			0.36	0.7
BLD240-03-Fill	pCi/g			17.9	71
BLD240-04-02	pCi/g			0.02	1.7
BLD240-04-04	pCi/g			0.3	0.9
BLD240-04-Fill	pCi/g			0.7	2.59
BLD240-05-01	pCi/g			-0.08	1.37
BLD240-05-02	pCi/g			-0.4	1.6
BLD253-02-01	pCi/g			0.9	3.7
BLD253-02-04	pCi/g	7.5	172	9.5	11.7
BLD253-02-Fill	pCi/g			1.2	2.6
BLD255-05-Fill	pCi/g			0.17	1.7
BLD255-07-02	pCi/g			0.06	1.7
BLD255-07-15	pCi/g			0.37	1.1
BLD255-07-Fill	pCi/g			0.17	0.8
BLD255-08-01	pCi/g	30.2	604	23.1	13.8
BLD255-08-08	pCi/g			0.34	0.85
BLD260-06-01	pCi/g		17.8	0.87	5.04
BLD260-06-03	pCi/g			0.12	0.6
BLD260-06-FILL	pCi/g			3.34	16.4

2.5 Site Conditions Justifying a Removal Action

As established under the NCP, whenever a planning period of at least six months exists before on-site activities must be initiated, a non-time-critical removal action is deemed appropriate, 40 CFR § 300.415(b)(4). In the current situation, conditions at the FFCF necessitate taking relatively prompt action to address the radiologically contaminated buildings and equipment as well as the potential for impacts to environmental media at the FFCF. Moreover, the issues discussed in this EE/CA can be addressed through the implementation of readily available and relatively non-complex, cost-effective solutions.

Section 300.415(b)(2) of the NCP, 40 CFR § 300.415(b)(2), provides several criteria for evaluating the need for and selection of removal actions under CERCLA. If conditions at a CERCLA site satisfy the conditions of one or more of these criteria, the NCP suggests that it is appropriate to consider conducting a removal action.

Conditions regarding contaminated buildings addressed in this EE/CA satisfy at least the following two criteria, justifying the performance of a removal action:

- “Actual or potential exposure to nearby human populations, animals, or food chain from hazardous substances or pollutants or contaminants”
- “Actual or potential contamination of drinking water supplies or sensitive ecosystems”

The presence of uranium contamination in these buildings as discussed in Section 2.3, if left unaddressed, could present a threat to public health, welfare, and/or the environment, thereby providing justification for a removal action. In addition, the presence and potential presence of impacts beneath the buildings would interfere with the proper characterization and/or remediation of the FFCF into the future.

Furthermore, the DOE, which is responsible for addressing sites similar to the FFCF on a routine basis, has issued guidance indicating that it is appropriate to address decontamination and/or dismantlement of radiologically impacted buildings and equipment under CERCLA’s non-time-critical removal action authority.¹ According to

¹ As noted in the DOE guidance:

Decommissioning includes those activities which take place after a facility has been deactivated and placed in an ongoing surveillance and maintenance program. Decommissioning can include decontamination and dismantlement. Decontamination encompasses the removal or reduction of radioactive or hazardous contamination from facilities. Dismantlement involves the disassembly or demolition, and removal, of any structure, system, or component and the interim or long-term disposal of waste materials in compliance with applicable requirements.

Policy on Decommissioning Sites Under CERCLA, DOE, May 1995, pg. 1.

DOE's *Policy on Decommissioning Sites Under CERCLA*, May 1995 (Ref. 6), a non-time-critical removal action for decommissioning facilities is consistent with the objectives of CERCLA because it: (1) ensures protection of public health, site workers, and the environment; (2) provides for stakeholder involvement; and (3) achieves risk reduction without unnecessary delay. In addition, the alternative approaches for decommissioning impacted facilities and equipment are generally clear and limited, thereby streamlining decision making and reducing the need for a comprehensive evaluation of alternatives that would be required under CERCLA's remedial program. Removal action authority is similarly appropriate so as to facilitate the further characterization and, if necessary, the future remediation of potential impacts beneath the buildings. As noted in the DOE guidance, a removal action is appropriate when, as here, it is apparent that the action will prevent, minimize, stabilize, or eliminate the risks that may be posed to human health and the environment by the conditions associated with the facilities and equipment.

2.6 Streamlined Risk Evaluation

The streamlined risk evaluation discussion is presented in three sections—human health risks, ecological risks, and proposed cleanup levels.

2.6.1 Human Health Risks

There is a potential human health risk via direct contact with the radiological contamination present in the site buildings. It should be noted that currently all of the buildings are located in the site general work area, which is accessed by Westinghouse employees, contractors, subcontractors, security personnel, and visitors on a routine basis. The more highly contaminated process buildings are located within a security fence. The buildings located outside the security fence—Buildings 101, 110, 115, and 120—are either not contaminated or contain low concentrations of radioactive contamination.

There is also risk posed by potentially contaminated soil and groundwater beneath the buildings that cannot be currently characterized or later remediated because of the interference posed by the buildings. Finally, there is risk associated with the potential spread of radioactive contamination from the buildings or the soil and groundwater beneath the buildings into surrounding soil and water pathways, allowing for human exposure. The technetium-99 in the groundwater discussed in Section 2.3 is evidence of how contamination can spread in the soil and groundwater.

2.6.2 Ecological Risks

There is ecological risk associated with the potential spread of radioactive contamination from the buildings or the soil and groundwater beneath the buildings into surrounding soil and water pathways. Spread of contamination from inside the building to the

environment is currently limited by a comprehensive radiological protection program and controlled access to the process buildings. However, any contamination in the soil and groundwater underneath the buildings can migrate to the surrounding environment, potentially affecting nearby groundwater, streams, and vegetation.

2.6.3 Proposed Cleanup Levels

If buildings are left in place, cleanup levels will be consistent with unrestricted use requirements in NRC License Termination Rule, 10 CFR 20, Subpart E. The basic concept for managing exposures to ionizing radiation and releases of radioactive materials to reduce collective doses as far below regulatory limits as is reasonably achievable is the driver for the proposed cleanup levels. Reducing the exposure on-site to ALARA includes performing cleanup to limits that are as low as possible through additional planning and management, remediation, and the use of additional resources to achieve a lower collective dose level.

Demolition would remove all contaminated equipment and above-grade structures down to, but not including, the concrete floor pads. Soil and groundwater impacts, to the extent they are identified, will be addressed in another phase of the project consistent with the approved Remedial Investigation/Feasibility Study Work Plan for the FFCF.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

Removal action objectives are media-specific goals that are established to protect human health and the environment. The specific components of the objectives are defined in Sections 3.1 through 3.5.

The objectives of the removal action for buildings and equipment are as follows:

- Protect human health and the environment by minimizing the release or threat of release of radioactive contaminants from buildings and equipment.
- Allow for the characterization of contaminated soil and groundwater beneath the buildings.
- Address buildings and structures that may interfere with remediation of soil and groundwater.
- Comply with applicable and relevant or appropriate requirements, including requirements imposed by the NRC in connection with site decommissioning under the NRC license issued to the FFCF.

3.1 Statutory Limits

Authority for responding to releases or threats of releases from an impacted site is addressed in Section 104(a) of CERCLA, 42 USC § 9604(a). CERCLA, Section 104(a), and Section 300.415 of the NCP, 40 CFR § 300.415, address non-time-critical removal actions. It should be noted that statutory limits under CERCLA and the NCP regarding duration and funding apply only to removal actions paid for with Superfund monies and are not applicable to responses undertaken by private parties.

3.2 Scope and Purpose

The scope and purpose of the removal action is to reduce risk to public health, site workers, and the environment posed by the release and/or substantial threat of release of hazardous substances at the FFCF. This removal action also is intended to facilitate the characterization and future remediation, if necessary, of soil and groundwater under the buildings that may be impacted by activities in and around the buildings.

3.3 Removal Action Schedule

The schedule for removal activities will be determined by Westinghouse based upon applicable requirements set forth in the NCP as well as input from the NRC and the MDNR. The removal action schedule will be designed within a time frame that ensures adequate protection of public health and the environment and is consistent with: (1) the NCP and related guidance; (2) the site decommissioning activities under NRC License No. SNM-33; and (3) the Hematite Decommissioning Plan.

3.4 Planned Remedial Activities

Westinghouse is currently evaluating the FFCF pursuant to the procedures and schedules established in the Remedial Investigation/Feasibility Study Work Plan and the Hematite Decommissioning Plan, and future remedial steps for the site will be implemented through the process identified in those plans. The removal action selected within the scope of this EE/CA will, to the extent practicable under the circumstances, be consistent with any future remedial steps taken at the FFCF.

3.5 Applicable or Relevant and Appropriate Requirements

Applicable or Relevant and Appropriate Requirements (ARARs) are federal and state human health and environmental requirements used to define the appropriate extent of site cleanup, identify sensitive land areas or land uses, develop remedial alternatives, and direct site remediation. CERCLA and the NCP require that remedial actions comply with state ARARs that are more stringent than federal ARARs, are legally enforceable, and are consistently enforced statewide. While ARARs are not directly applicable to removal actions, the NCP suggests that ARARs be attained to the extent practicable under the circumstances.

The NCP defines two ARAR components: 1) applicable requirements and 2) relevant and appropriate requirements. Applicable requirements are cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, or other circumstance found at a CERCLA site. State standards that might be applicable are only those that have been identified by the state in a timely manner, are consistently enforced, and are more stringent than federal requirements.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements under federal and state environmental and facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminant, or remedial action, address situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements might be relevant and appropriate.

Other requirements to be considered (TBC) are federal and state non-promulgated advisories or guidance that are not legally binding and do not have the status of potential ARARs (i.e., they have not been promulgated in statute or regulations). However, if there are no specific ARARs for a chemical or site condition or if ARARs are deemed insufficiently protective, then guidance or advisory criteria should be identified and used to ensure the protection of human health and the environment.

Under the description of ARARs set forth in the NCP and Superfund Amendments and Reauthorization Act (SARA), state and federal ARARs are categorized as follows:

- Chemical-specific—governing the extent of site remediation with regard to specific contaminants and pollutants.
- Location-specific—governing site features such as wetland, floodplains, and sensitive ecosystems and pertaining to existing natural and manmade site features, such as historical or archaeological sites.
- Action-specific—pertaining to the proposed site remedies and governing the implementation of the selected site remedy.

As described in the *CERCLA Compliance with other Laws Manual* (Ref. 7), several agencies have authority over the cleanup of sites impacted with radioactive materials, including the DOE, NRC, U.S. Environmental Protection Agency (EPA), and state agencies. The standards and guidance of the various groups are designed to be consistent with one another, and they often overlap in scope and purpose and incorporate the same basic provisions. The regulatory agencies rely on reports and models developed by health physics organizations including the International Commission on Radiological

Protection (ICRP), the National Council on Radiation Protection (NCRP), and the committee on the Biological Effects of Ionizing Radiation (BEIR) when radiological contaminants are present. In general, public health standards and guidelines are developed to protect individuals, future generations, and populations from unnecessary exposure to radiation. The basic concept is that all radiation might be harmful to human tissue, and therefore, exposure must be reduced to As Low As Reasonably Achievable (ALARA).

Chemical-specific ARARs and TBCs for the contaminated buildings and equipment are summarized in Table 3-1, and action-specific ARARs and TBCs are summarized in Table 3-2. There are no location-specific ARARs or TBCs associated with the removal action. As part of the analysis of removal action alternatives in Section 5.0, each alternative is analyzed to determine its compliance with ARARs.

Table 3-1
Potential Chemical-Specific ARARs/TBCs

Standard, Requirement, Criteria, or Limitation	Description of Requirements	Status	Comment
NRC Standards for Protection Against Radiation, 10 CFR 20, Subpart E	This NRC rule establishes standards for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC. Specifically, this NRC rule controls the handling of licensed material in such a manner that the total dose to an individual does not exceed specified standards set forth in this NRC rule.	Applicable	Commitment in Hematite Decommissioning Plan
<i>NRC Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material</i> , April 1993	This NRC guidance sets default surface radioactivity guidelines for release of equipment and non-environmental materials (e.g., walls, floors, etc.).	Applicable	Site license specification for release of equipment and materials

Table 3-2
Potential Action-Specific ARARs/TBCs

Standard, Requirement, Criteria, or Limitation	Description of Requirements	Status	Comment
General construction standards – site preparation, demolition, and any land-disturbing activities			
Occupational Safety and Health Administration (OSHA) - General Industry Standards (29 CFR 1910)	Specifies the 8-hour, time-weighted average concentration for various organic compounds. Training requirements for workers in hazardous waste operations are specified in 20 CFR 1910.120.	Applicable	The site-specific Health and Safety Plan (HASP) contains applicable information.
Health and Safety Requirements for Construction Activities (29 CFR 1926)	Establishes construction standards	Applicable	Applicable to all alternatives for the protection of workers.
Control of Fugitive Dust (RCSA §22a-172-18(b))	When conducting remedial activities, reasonable precautions have to be taken to prevent particulate matter from becoming airborne. No visible particulate may be emitted beyond the boundary of the site or cause a nuisance.	Applicable	Applicable to the control of fugitive dust emissions for the building demolition alternative.
Clean Air Act – National Emission Standards for Radionuclide Emissions From Facilities Licensed by the NRC and Federal Facilities Not Covered by Subpart H (40 CFR 61, Subpart I)	Emission levels shall not exceed an effective dose equivalent of 10 mrem/year	Applicable	Emissions levels are limited via the Hematite license to 5×10^{-12} $\mu\text{Ci/ml}$ alpha, not to exceed 150 $\mu\text{Ci/qtr}$.
General transportation or worker protection standards			
Hazardous Materials Transportation Regulations (29 CFR 173, Subpart I–1992)	The U.S. Department of Transportation (DOT) definition of "radioactive material" set forth in this subpart is any material having a specific activity greater than 0.002 millicuries per gram (mCi/g), or 2,000 picocuries per gram (pCi/g). This minimum specific activity number includes all uranium, radium, and thorium daughter products. Radionuclides that surpass minimum quantity (and allowable specific activity) requirements are DOT-regulated, low specific activity materials.	Applicable	Applicable to radioactive materials.

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Standard, Requirement, Criteria, or Limitation	Description of Requirements	Status	Comment
Hazardous Materials Transportation Regulations (29 CFR 171–179)	Part 171 establishes basic definitions and provisions for transporting any hazardous materials, as listed on the HMTA Table in Part 172. Part 172 also contains marking, labeling, placarding, and training requirements. Part 173 contains general requirements for shipments and packaging. Part 172 governs carriage by rail, and Part 177 governs carriage by public highway.	Applicable	Specific subparts or sections of these regulations set out radioactive waste transportation requirements.
OSHA - Record keeping, Reporting, and Related Regulations (29 CFR 1902)	Outlines the record keeping and reporting requirements for an employer under OSHA.	Applicable	These requirements apply to all site contractors and subcontractors and must be followed during all site work under 40 CFR 300.150.
Notices, Instructions, and Reports to Workers: Inspection and Investigations (10 CFR 19)	Applies to all persons who receive, possess, use, or transfer material licensed by the NRC.	Applicable	These requirements apply to all site contractors and subcontractors and must be followed during all site work.
Domestic Licensing of Special Nuclear Material (10 CFR 70)	Establishes procedures and criteria for the issuance of licenses to receive title to, own, acquire, deliver, receive, possess, use, and transfer special nuclear material.	Applicable	Sets out radioactive waste transportation requirements.
Packaging and Transportation of Radioactive Material (10 CFR 71)	Establishes requirements for packaging, preparation for shipment, and transportation of licensed material.	Applicable	Sets out radioactive waste transportation requirements.
Physical Protection of Plants and Material (10 CFR 73)	Prescribes requirements for the establishment and maintenance of a physical protection system that will have capabilities for the protection of special nuclear material at fixed sites and in transit.	Applicable	Sets out radioactive waste transportation requirements, which are incorporated in the Project Transportation Plan.
NRC (Standards for Protection Against Radiation), Transfer for Disposal and Manifests (10 CFR 20.2006)	Provides that transfer of radioactive waste intended for land disposal is accompanied by a manifest and conducted in accordance with specified regulations.	Applicable	Applicable only to commercial disposal.

4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Removal action alternatives should accomplish the identified removal action objectives. Alternatives that meet these objectives will be further evaluated according to the criteria of effectiveness, ability to implement, and cost. For the purposes of this EE/CA, three removal action alternatives are considered.

4.1 Alternative 1: No Action with Engineering Controls

A “no-action” alternative would allow contaminated buildings and equipment to remain in place. Administrative actions (e.g., proper and periodic surveys) and engineering controls (e.g., long-term maintenance of security fencing and warning signs) would be included as part of the no-action alternative. As discussed below, the no-action alternative does not achieve the objectives of the removal action. This alternative is carried through the analysis for comparative purposes.

4.2 Alternative 2: Equipment Removal and Building Decontamination

This alternative would allow buildings to remain in place, but all of the equipment in the buildings would have to be removed for disposal or recycling at a permitted facility. As discussed in Section 2.3, the equipment is radioactively contaminated and poses a threat to human health and the environment. Removal is the best option because decontamination of equipment is labor intensive and often ineffective. Decontamination also places workers at increased risk of exposure to contamination and is not consistent with ALARA principles when cost-effective disposal options are readily available.

Decontamination of building surfaces would be performed by workers inside the buildings in close proximity to the radioactive contamination being removed. The building surfaces would be decontaminated to levels allowing unrestricted use in order to achieve the objectives of the removal action.

As discussed below, characterization of the soil and groundwater beneath the buildings is a primary objective of the removal action, and leaving the buildings in place would interfere with that objective. In addition, if the environmental media beneath the buildings ultimately need to be remediated, this would not be a viable alternative because the buildings would be an interference to that remediation.

4.3 Alternative 3: Equipment Removal and Building Demolition

This alternative would require the demolition of contaminated buildings down to the concrete floor slabs, which would be removed in another phase of the project. Demolition would remove the buildings as a source of contamination and as an interference to soil characterization and potential soil and groundwater remediation underneath the buildings. As with Alternative 2, equipment would be removed for

disposal or recycling at a permitted facility. This alternative is described in greater detail in the Environmental Report for building demolition at the FFCF that will be submitted to the NRC to support the license amendment that implementation of this alternative would require.

5.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

As noted earlier, the scope and purpose of the removal action is to reduce risk to public health, site workers, and the environment posed by the release and substantial threat of release of hazardous substances at the FFCF. This removal action is also intended to facilitate the characterization and future remediation, if necessary, of soil and groundwater under the buildings that may be impacted by activities in and around the buildings. The removal alternatives were evaluated using EPA's *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA* (Ref. 8).

This section evaluates the three removal action alternatives identified in Section 4.0 based on their effectiveness, ability to be implemented, and cost in relation to site-specific conditions.

5.1 Effectiveness

The effectiveness of a removal action alternative refers to its ability to meet the objectives within the scope of the removal action. The effectiveness and reliability of the removal action alternatives are evaluated with respect to the hazardous substances and conditions at the site. One of the criteria considered is the overall protection each alternative affords to public health (Section 5.1.1.1), site workers (Section 5.1.1.2), and the environment (Section 5.1.1.3). Consideration is also given to an alternative's compliance with applicable ARARs (Section 5.1.2) and the useful life of the processes within a removal alternative, i.e., the length of time that it performs its intended function (Section 5.1.3).

5.1.1 Overall Protection of Public Health, Site Workers, and the Environment

5.1.1.1 Protective of Public Health

This criterion is concerned with whether an alternative provides adequate protection of public health and how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Under Alternative 1, the risk of potential public exposure to contaminants at the site is not reduced or eliminated. Although engineering and institutional controls would potentially assist in limiting exposure to the contaminants in the site buildings in the near term, uncontrolled releases or exposures could still occur. Moreover, radioactive contamination in the buildings or in the soil and/or groundwater beneath the buildings

would have the potential to be spread into surrounding soils and water pathways, allowing for potential public exposure in the future. In addition, this alternative does not achieve the removal action objective of allowing proper characterization, and if necessary, remediation of soils and groundwater beneath the buildings.

Under Alternative 2, decontamination of buildings to unrestricted use levels and removal of equipment would afford some long-term protection of public health, but contaminated soil and/or groundwater underneath the buildings would continue to pose a long-term public health risk. There would be short-term risks associated with the long-distance transport of contaminated materials to a permitted disposal facility. Public exposure would be minimized during transport by inspecting the vehicles before and after use, decontaminating the exterior of waste packages when needed, using only covered waste packages, observing safety protocols, and following pre-designated routes. Transportation risks increase with distance and volume, although the potential for any spillage and resultant public exposure are very low. The transport of wastes to an off-site disposal facility would comply with U.S. Department of Transportation (DOT) and other applicable federal regulations.

Under Alternative 3, the long-term risk of potential public exposure to radioactive contamination from site buildings is completely eliminated. This alternative also eliminates the buildings as an interference to characterization and, if necessary, remediation of soil and/or groundwater underneath the buildings.

5.1.1.2 Protective of Site Workers

This criterion addresses whether an alternative provides adequate protection of site workers and describes how potential occupational doses and injuries are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Under Alternative 1, there would be a continued risk of worker exposure to contaminants because necessary maintenance and surveillance activities would require workers to continue to work inside the contaminated buildings on a routine basis. Appropriate personal protection equipment would be required and proper radiological controls and procedures would have to be maintained for all on-site work. Also, maintaining the buildings in place would not allow for adequate characterization and remediation, if necessary, of soil and/or groundwater beneath the buildings, resulting in increased potential for spread of soil and water contamination and subsequent worker exposure.

Under Alternative 2, decontamination activities would be performed by workers inside the buildings in close proximity to the radioactive contamination being removed. This would stir up the loose contamination and increase the potential for occupational doses to workers due to direct exposure, inhalation, or ingestion of contaminants. Handling and packaging of the resulting radioactive waste also would increase the potential for worker exposure to contamination. As with Alternative 1, maintaining the decontaminated

buildings in place would not allow for adequate characterization and remediation, if necessary, of soil and/or groundwater beneath the buildings, resulting in increased potential for spread of soil and water contamination and subsequent worker exposure.

Worker exposure and injuries would be mitigated through implementation of a comprehensive health and safety program and radiological protection program, including good safety practices, personal protective equipment, and restrictions on access to contaminated areas. In addition, machinery and equipment would be inspected after use, surveyed for contamination, and decontaminated if necessary. No occupational or safety barriers that would prevent the implementation of these remedies are foreseen.

Under Alternative 3, building demolition and equipment removal activities would involve less direct worker contact with radioactive contamination and lower potential for occupational dose than building decontamination. The potential for exposure due to handling and packaging of the resulting radioactive waste would be similar to Alternative 2. Worker exposure would be minimized by using water to control fugitive emissions during demolition of the building structures and by implementing the health, safety, and radiological protection practices discussed in Alternative 2.

5.1.1.3 Protective of the Environment

This criterion addresses whether an alternative provides adequate protection against the transfer of radioactive contamination from the site buildings to the on- or off-site environments. It also considers whether the alternative in question is consistent with or facilitates the adequate characterization of potential impacts to the environment.

Under Alternative 1, the risk of environmental impact is not changed. The potential for spreading contamination from the buildings and/or underlying soils and groundwater would continue to exist for the long term. Effective radiological controls and procedures would have to be continued in and around the buildings to mitigate the spread of contamination in the environment.

Under Alternative 2, decontamination of buildings to unrestricted use levels and removal of equipment would afford some long-term protection of the environment. However, as with Alternative 1, contaminated soil and/or groundwater underneath the building would continue to pose a long-term environmental risk. In the short term, mechanical decontamination methods would generate increased amounts of loose contamination that could potentially be transferred to the outside environment through the air, on equipment, or on clothing. In addition, the handling, packaging, and transportation of the resulting contaminated waste pose a short-term risk of releases to the environment. Airborne releases of contamination would be minimized with the use of proper ventilation and filtering equipment. Implementation of a comprehensive radiological protection program, including contamination surveys, personnel contamination monitoring, restrictions on access to contaminated areas, and effective radioactive waste controls,

would further mitigate the spread of contamination to the environment. Any emissions from cleanup activities should be well within EPA guidelines regarding ambient air pollution concentrations and are expected to have a negligible effect on the air quality at the site. Damage to the environment caused by equipment and personnel would be minimal due to the fact that most of the response activities would be confined to the fenced plant area, which would be restored as appropriate.

Under Alternative 3, the long-term risk of spreading contamination from site buildings to the environment is completely eliminated by removing the contaminated buildings and equipment from the site. This alternative also eliminates the buildings as an interference to characterization and, if necessary, remediation of soil and/or groundwater underneath the buildings. The short-term risk to the environment from building demolition is similar to that presented for building decontamination under Alternative 2.

5.1.2 Compliance with ARARs

This criterion addresses the level of compliance that removal action alternatives have with ARARs.

Alternative 1 does not comply with chemical-specific or action-specific ARARs given that this alternative does not eliminate the possibility of exposure to radiological impacts in and from the buildings or allow for characterization of the buildings or underlying soil and groundwater. There are no location-specific ARARs.

Alternative 2 complies with chemical-specific or action-specific ARARs with respect to the buildings and equipment because NRC-dictated cleanup levels will be met. However, because Alternative 2 does not allow for characterization of soil and groundwater beneath the buildings, Alternative 2 does not comply with chemical-specific or action-specific ARARs with respect to soils and groundwater. There are no location-specific ARARs.

Alternative 3 complies with chemical-specific and action-specific ARARs. Because it offers a permanent, off-site disposal solution, no additional ARARs will be triggered. There are no location-specific ARARs.

5.1.3 Useful Life

This criterion addresses the level of permanence or useful life of removal action alternatives.

Under Alternative 1, no action is taken to meet the removal action objectives. As such, this alternative offers no long-term or permanent effectiveness in removing the site buildings as a source of radioactive contamination. Furthermore, this alternative does not allow for adequate characterization of the soil and groundwater beneath the buildings.

Under Alternative 2, decontamination of the buildings to unrestricted use levels and removal of equipment would provide long-term effectiveness in meeting some of the stated removal action objectives. However, this alternative does not allow for adequate characterization of the soil and groundwater beneath the buildings.

Under Alternative 3, removal of the buildings and equipment would provide complete removal of radioactive contamination and interference to soil and groundwater characterization and remediation and provide a high degree of long-term effectiveness.

5.2 Ability to Implement

The ability to implement a removal action alternative encompasses both the technical and administrative feasibility, the availability of required services and materials, and regulatory agency and community acceptance.

5.2.1 Technical Feasibility

Three important aspects of technical feasibility are (1) availability and reliability of the processes within a removal action alternative; (2) construction and implementation timeframe; and (3) environmental conditions with respect to all relevant phases of the alternative. Implementation time and the period for beneficial results to be realized are critical factors in protecting public health and the environment.

Under Alternative 1, technical feasibility is not an issue because no action is taken.

Under Alternative 2, removal of equipment and decontamination of site buildings is technically feasible in terms of availability, proven reliability, and timeframe for receipt of necessary equipment and technologies. However, in comparison to Alternatives 1 and 3, Alternative 2 involves more schedule and cost uncertainty because of the potential to find more or harder-to-remove contamination than expected. Available methods for decontamination of building surfaces and for disposal of the resulting radioactive waste have been proven in the industry to be reliable, and technical problems potentially leading to significant scheduling delays are not anticipated. Commercial disposal facilities for the type of waste that would be encountered are currently available. Appropriately trained personnel are readily available to perform decontamination, health physics, industrial safety, and waste management tasks.

The technical feasibility of Alternative 3 is similar to that of Alternative 2 in that equipment, proven methods, trained personnel, and waste disposal facilities are readily available to accomplish building demolition and disposal. Schedule and cost uncertainties should be less than for Alternative 2. Although weather conditions could be a factor during the building demolition phase of the work, severe weather conditions could be mostly avoided by scheduling demolition work during appropriate times of the year. Also, various engineering controls, such as tenting and run-off protection, could be

used to mitigate potential environmental impacts due to weather conditions during demolition.

5.2.2 *Administrative Feasibility*

Administrative feasibility deals with the ability to coordinate removal action activities with various offices, agencies, and the public. Effective coordination includes obtaining approvals from government agencies, receiving inter-agency cooperation, obtaining off-site permits, complying with regulatory policies and requirements, and obtaining public acceptance.

Alternative 1, no action with engineering controls, is not expected to receive long-term acceptance from government agencies or the public.

Alternative 2 is administratively feasible. Decontamination is recognized by federal and state agencies as an acceptable method for releasing buildings for unrestricted use. The transportation of radioactive waste to permitted, off-site disposal facilities is also acceptable to state and federal agencies. Public acceptance of waste transportation from the site has historically not been an issue. However, leaving contaminated soil and/or groundwater underneath the buildings would not receive long-term acceptance from government agencies or the public.

Alternative 3 is administratively feasible. This is a similar situation to Alternative 2 where proven methods have been acceptable to government agencies and the public. Demolition of site buildings would comply with applicable regulations. A license amendment would be required from the NRC, but such a process is not expected to be problematic. No opposition to building demolition is expected from the public.

5.3 **Cost**

The purpose of the EE/CA cost estimate is to compare the relative costs for various remediation alternatives. Relative capital costs and operational and maintenance costs might be used rather than detailed estimates. The cost analysis is based on contractor estimates, engineering judgment, and experience on other similar projects. The alternatives are evaluated on their cost relative to each other. Although there would be long-term building maintenance and security costs for Alternative 1, these costs are not estimated because Alternative 1 does not achieve the objectives of the removal action. The comparative cost analysis for Alternatives 2 and 3 is shown in Table 5-1.

Table 5-1
Cost Analysis of Alternatives

Task	Description	Alternative 2 Equipment Removal and Building Decontamination	Alternative 3 Equipment Removal and Building Demolition
1	Mobilization	\$382,000	\$382,000
2	Site preparation	\$83,000	\$83,000
3	Equipment removal	\$2,291,000	\$2,291,000
4	Building decontamination	\$12,000,000	—
5	Ventilation removal	\$780,000	\$600,000
6	Building demolition	\$729,000	\$2,430,000
7	Waste containers, packaging, and transportation	\$451,000	\$1,815,000
8	Demobilization	\$300,000	\$300,000
9	Radioactive waste disposal	\$473,000	\$300,000
10	Final survey	\$520,000	—
	Total Estimated Cost	\$18,009,000	\$8,201,000

Comments:

1. Project management and administrative costs are included in the above costs.
2. The estimate for Task 9 assumes that building decontamination waste (Alternative 2) will go to Envirocare, and building demolition waste (Alternative 3) will go to a permitted landfill.

5.4 Summary of Removal Action Alternatives

This section summarizes the results of the analysis of all removal action alternatives. Each removal action alternative is evaluated for its effectiveness, ability to be implemented, and relevant cost.

5.4.1 *Alternative 1 in Summary*

- Low rank in effectiveness with respect to long-term protection of public health, site workers, and the environment; compliance with ARARs; and useful life. Low rank in effectiveness with respect to meeting the removal objective of allowing for characterization and remediation, if required, of soil and groundwater contamination under buildings.
- Low rank in ability to implement with respect to administrative feasibility.
- High rank for cost in that “no action” would be the least expensive alternative.

5.4.2 *Alternative 2 in Summary*

- Medium rank in effectiveness with respect to long-term protection of public health, site workers, and the environment; compliance with ARARs; and useful life. Low rank in effectiveness with respect to meeting the removal objective of allowing for characterization and remediation, if required, of soil and groundwater contamination under buildings.
- High rank in ability to implement with respect to technical feasibility. Medium rank with respect to administrative feasibility because of the potential for leaving contaminated soil and/or groundwater underneath the buildings.
- Low rank for cost in that it is the most expensive alternative

5.4.3 *Alternative 3 in Summary*

- High rank in effectiveness with respect to long-term protection of public health, site workers, and the environment; compliance with ARARs; and useful life. High rank in effectiveness with respect to meeting the removal objective of allowing for characterization and remediation, if required, of soil and groundwater contamination under buildings.
- High rank in ability to implement with respect to technical and administrative feasibility.
- Medium rank for cost in that it is the less expensive of the two highest ranked alternatives.

6.0 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

The purpose of the comparative analysis is to identify the advantages and disadvantages of the alternatives when compared with each other, based on the analyses described in

Sections 4 and 5. This comparative analysis allows identification of items that can be evaluated to make the final selection of a removal action. Table 6-1 summarizes the comparative analysis of removal action alternatives based on effectiveness, ability to implement, and cost.

Effectiveness—Alternative 3 is ranked highest in effectiveness because it completely removes the sources of building contamination and eliminates the buildings as an interference to characterization and, if necessary, remediation of soil and/or groundwater underneath the buildings. This affords long-term protection of the public and environment and facilitates decommissioning of the site for unrestricted use.

Alternative 2 is ranked medium in effectiveness because it does not remove the buildings as an interference to characterization and, if necessary, remediation of soil and/or groundwater underneath the buildings. Also, it affords less short-term protection to workers because building decontamination would require workers to be in close proximity to the radioactive contamination being removed.

Alternative 1 is ranked lowest in effectiveness because it provides no long-term protection of the public and environment.

Ability to Implement—Alternatives 2 and 3 are both ranked high on technical feasibility because equipment, proven methods, trained personnel, and waste disposal facilities are readily available to accomplish building decontamination or demolition.

Alternative 2 is ranked lower than Alternative 3 on administrative feasibility because of the potential for leaving contaminated soil and/or groundwater underneath the buildings if the buildings are not removed.

Alternative 1 is ranked low in administrative feasibility because taking no action on removing building contamination is not expected to receive long-term acceptance from government agencies or the public.

Cost—Alternative 3 is ranked medium on cost because the estimated costs are lower than for Alternative 2.

Alternative 2 is ranked low on cost because it is the most expensive alternative

Alternative 1 is ranked high on cost only because it involves no action and minimal cost.

**Table 6-1
Evaluation Comparison**

Measure	Alternative 1	Alternative 2	Alternative 3
Effectiveness <ul style="list-style-type: none"> Protects public health Protects site workers Protects environment Complies with ARARs Useful life Removal action objective for interference 	Low Low	Medium Low	High High
Ability to Implement <ul style="list-style-type: none"> Technical feasibility Administrative feasibility 	N/A Low	High Medium	High High
Cost	High	Low	Medium

7.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Based on the results of the comparison of alternatives in Section 6.0, the recommended removal action is Alternative 3. This is the highest rated alternative for site buildings that contain radioactive contamination or have contaminated soil and/or groundwater underneath their floor slabs. This alternative also allows for characterization and future remediation, if necessary, of impacted soil and/or groundwater beneath the buildings.

8.0 POST-REMOVAL ACTION SITE CONTROL ACTIVITIES

Post-removal action site control activities are not necessary to sustain the integrity of the recommended removal action. The removal action would remove contaminated buildings down to the concrete floor slabs. The floor slabs and underground structures will also need to be removed for the reasons set forth in this EE/CA, but such work will be reserved until later phases of the decommissioning/remediation project. A site-wide Final Status Survey will be performed at the appropriate time to confirm that site impacts have been addressed to acceptable means (e.g., release of the site for unrestricted use).

9.0 REFERENCES

1. Westinghouse Electric Co., *Historical Site Assessment*, DO-02-001, May 20, 2003.
2. 42 USC § 9601 et seq., “Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund),” *United States Code*.
3. 40 CFR 300, “National Oil and Hazardous Substances Pollution Contingency Plan,” *Code of Federal Regulations*, Office of the Federal Register, July 2003.
4. Westinghouse Electric Co., *Hematite Decommissioning Plan*, April 2004.
5. Westinghouse Electric Co., “Gamma Survey Data Evaluation Report,” June 2003.
6. DOE, *Policy on Decommissioning Sites Under CERCLA*, U.S. Department of Energy, May 1995.
7. EPA, *CERCLA Compliance with other Laws Manual*, EPA 520-G-89-009.
8. EPA, *Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, EPA 540-R-93-057, August 1993.

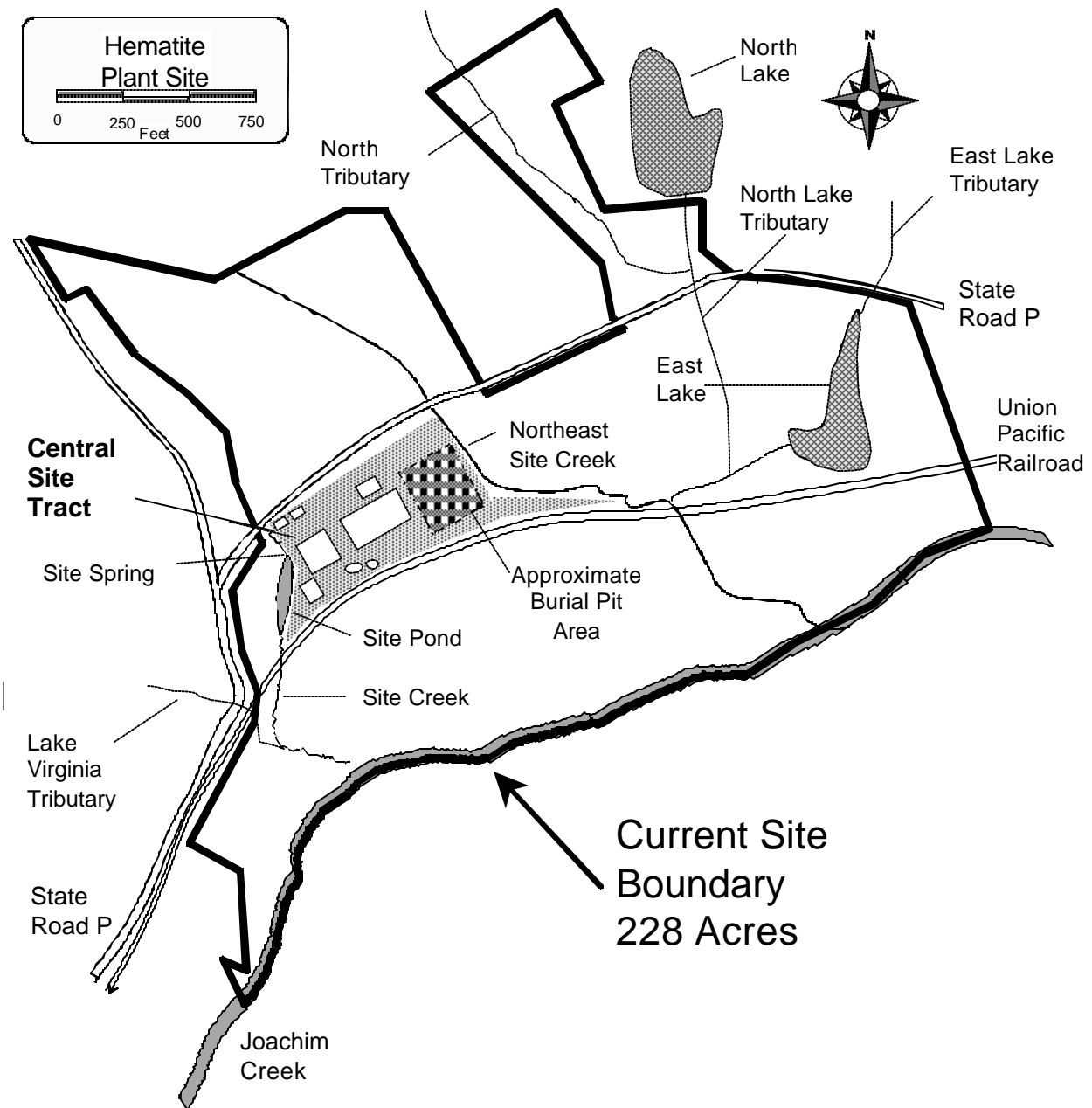
10.0 APPENDICES

Appendix A Site and Buildings Layouts

Appendix B Building Survey Data

Appendix A

Site and Buildings Layouts





Appendix B

Building Survey Data

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

Page: 16 of 26

RADIOLOGICAL SURVEY REPORT

FOR INFORMATION COPY
REC'D 6/28/04
2004-06

SURVEY LOCATION: Bldg 255						RWP: IR-04-024.1		Page 1 of 5						
PURPOSE OF SURVEY: Characterization Survey						DATE: 6/28/04		TIME: 10:02						
Instrument Type(s): (√ if used)		Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)					
			Meter	Detector	Meter	Detector	Alpha (α)	Beta (βγ)	Alpha (α)	Beta (βγ)				
<input checked="" type="checkbox"/> Ludlum 2929/43-10-1		N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6				
<input type="checkbox"/> Ludlum 2360/43-89		125												
<input type="checkbox"/> Ludlum 2221/44-9		15.5				N	A							
<input type="checkbox"/> Micro-R		N/A												
Contamination Limits: (dpm/100cm ²)			Removable α 20K		Removable βγ 20K		Total α N/A		Total βγ N/A					
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βγ Removable	Net CPM βγ Removable	dpm/100cm ² βγ Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βγ Total	Net CPM βγ Total	dpm/100cm ² βγ Total	mR/hr or μR/hr
1	Furnace	501	501	1399	444	395	973							
2	↓	1163	1163	3249	1202	1153	2840							
3	Equipment	702	702	1961	595	546	1345							
4	↓	123	123	344	105	56	138				A			
5	Door	998	998	2788	760	711	1751			N				
6	Cart	47	47	131	89	40	99							
7	Equipment	226	226	631	218	169	416							
8	↓	54	54	151	104	55	135							
9	↓	254	254	709	145	96	236							
10	Cart	495	495	1383	673	624	1537							
REMARKS: MDA(dpm/100cm ²) for 43-10-1= 13 alpha / 88 Beta														
TECHNICIAN(S) SIGNATURE/DATE: <u>Omig 298</u> / 6/28/04 <u>W. Clark Evans</u> / 6/28/04														
REVIEWER SIGNATURE/DATE: <u>And 275</u> / 7-9-04														

ATTACHMENT 1

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 255												Page 2 of 5			
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable βγ <u>20K</u>			Total α <u>N/A</u>			Total βγ <u>N/A</u>			
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βγ Removable	Net CPM βγ Removable	dpm/100cm ² βγ Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βγ Total	Net CPM βγ Total	dpm/100cm ² βγ Total	mR/hr or μR/hr	
11	Grinder	1105	1105	3087	750	701	1727								
12	↓	237	237	662	204	155	382								
13	Hood	370	370	1034	233	184	453								
14	↓	468	468	1307	383	334	823								
15	Cart	477	477	1332	442	393	968								
16	Equipment	213	213	595	224	175	431								
17	Lab Countertop	123	123	344	94	45	111				A				
18	↓	34	34	95	51	2	<MDA			N					
19	Hood	877	877	2450	2008	1959	4825								
20	Door	28	28	78	48	0	<MDA								
21	Equipment	106	106	296	164	115	283								
22	↓	51	51	142	102	53	131								
23	Stanchion	264	264	737	561	512	1261								
24	Cart	93	93	260	113	64	158								
25	Electrical Equipment	123	123	344	140	91	224								

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: Jim Ziegler / 6/28/04 W. Clark Ennis / 6/28/04

REVIEWER SIGNATURE/DATE: Don Ziegler / 7-9-04

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 255													Page 3 of 5			
Contamination Limits: (dpm/100cm ²)					Removable α <u>20K</u>			Removable βy <u>20K</u>			Total α <u>N/A</u>			Total βy <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βy Removable	Net CPM βy Removable	dpm/100cm ² βy Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βy Total	Net CPM βy Total	dpm/100cm ² βy Total	mR/hr or μR/hr		
26	Cart	62	62	173	83	34	<MDA									
27	Electrical Control Panel	95	95	265	125	76	187									
28	↓	1032	1032	2883	640	591	1456									
29	Table	449	449	1254	463	414	1020									
30	Electrical Panel	283	283	791	391	342	842									
31	Equipment	127	127	355	174	125	308									
32	↓	229	229	640	240	191	470									
33	↓	163	163	455	139	90	222									
34	Dewaxing	950	950	2654	1131	1082	2665									
35	↓	267	267	746	271	222	547									
36	Window	582	582	1626	378	329	810									
37	Equipment	404	404	1128	279	230	567									
38	↓	171	171	478	132	83	204									
39	↓	179	179	500	283	234	576									
40	↓	140	140	391	171	122	300									
REMARKS: N/A																
TECHNICIAN(S) SIGNATURE/DATE: <u>On 2008</u> / <u>6/28/04</u> <u>W. Clark Evans</u> / <u>6/29/04</u>																
REVIEWER SIGNATURE/DATE: <u>7-9-04</u>																

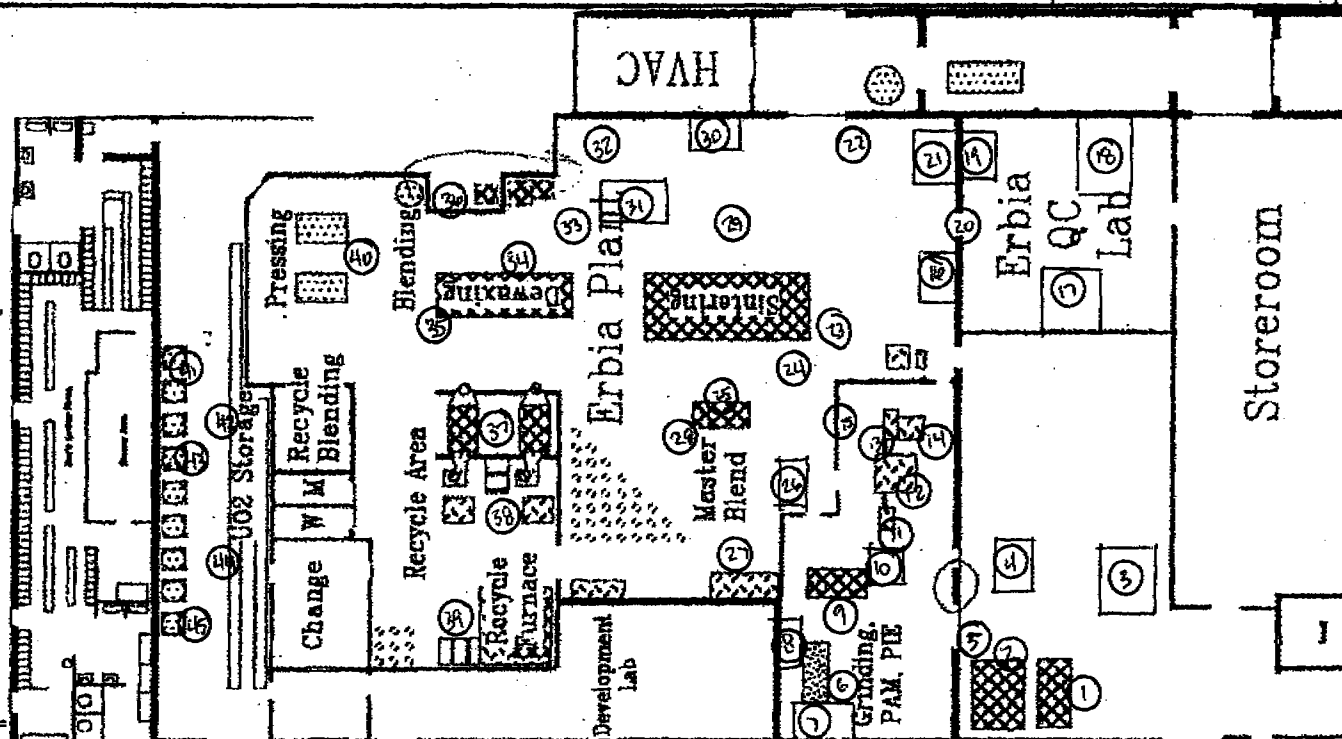
RADIOLOGICAL SURVEY REPORT (Supplement)[illegible]

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 28

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bldg 255		RWP: 1R-04-024.1	Page 5 of 5
LEGEND: (Fill in blank) <input checked="" type="checkbox"/> = Smear Location <u>N/A</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: 6/28/04	TIME: 10:02



REMARKS:

N/A

TECHNICIAN(S) SIGNATURE/DATE:

[Signature]

6/28/04

[Signature] 6/28/04

REVIEWER SIGNATURE/DATE:

[Signature]

7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RECORD COPY

RADIOLOGICAL SURVEY REPORT

SURVEY LOCATION: Bldg 260

RWP: IR-04-024.1

Page 1 of 3

PURPOSE OF SURVEY: Characterization Survey

DATE: 6/28/04

TIME: 10:32

Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		Meter	Detector	Meter	Detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10-1	N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6
<input type="checkbox"/> Ludlum 2360/43-89	125								
<input type="checkbox"/> Ludlum 2221/44-9	15.5								
<input type="checkbox"/> Micro-R	N/A								

Contamination Limits: (dpm/100cm ²)				Removable α <u>20K</u>			Removable βγ <u>20K</u>			Total α <u>N/A</u>			Total βγ <u>N/A</u>			
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βγ Removable	Net CPM βγ Removable	dpm/100cm ² βγ Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βγ Total	Net CPM βγ Total	dpm/100cm ² βγ Total	mR/hr or μR/hr		
1	Computer Desk	47	47	131	95	46	113	<div></div>								
2	Electrical Panel	135	135	377	145	96	236									
3	Equipment	549	549	1534	1029	980	2414									
4	Lab Countertop	478	478	1335	1044	995	2451					A				
5	Computer Monitor	46	46	128	94	45	111				N					
6	Hood	36	36	101	75	26	<MDA									
7	Cooler	58	58	162	90	41	101									
8	Air Vent	468	468	1307	343	294	724									
9	Equipment	349	349	975	294	245	603									
10	↓	432	432	1207	349	300	739									

REMARKS: MDA(dpm/100cm²) for 43-10-1= 13 alpha / 88 Beta

TECHNICIAN(S) SIGNATURE/DATE:

On 2/28/04

1 6/28/04

W. Clark Ennis 6/28/04

REVIEWER SIGNATURE/DATE:

Rand 2/28/04

1 7-9-04

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 255												Page 2 of 3		
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable βγ <u>20K</u>			Total α <u>N/A</u>			Total βγ <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βγ Removable	Net CPM βγ Removable	dpm/100cm ² βγ Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βγ Total	Net CPM βγ Total	dpm/100cm ² βγ Total	mR/hr or μR/hr
11	Electrical Panel	131	131	166	156	107	264							
12	Equipment	2344	2344	6547	1356	1307	3219							
13	Door	45	45	126	69	20	<MDA							
14	Equipment	841	841	2349	632	583	1436							
15		155	155	433	168	119	293							
16		34	34	95	70	21	<MDA				A			
17		59	59	165	81	32	<MDA			N				
18	▽	90	90	251	119	70	172							
19	Tank	205	205	573	312	263	648							
20	↓	201	201	561	252	203	500							
21	Platform	41	41	115	62	13	<MDA							
22	↓	142	142	397	164	115	283							
23	Electrical Panel	309	309	863	468	419	1032							
24	↓	189	189	528	160	111	273							
25	Door	54	54	151	96	47	116							

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: Jon G. [Signature] / 6/28/04 W. Clark [Signature] / 6/28/04

REVIEWER SIGNATURE/DATE: W. Clark [Signature] / 7-9-04

Title: Radiological Monitoring

RECORD COPY

Procedure: LVI-HP-11

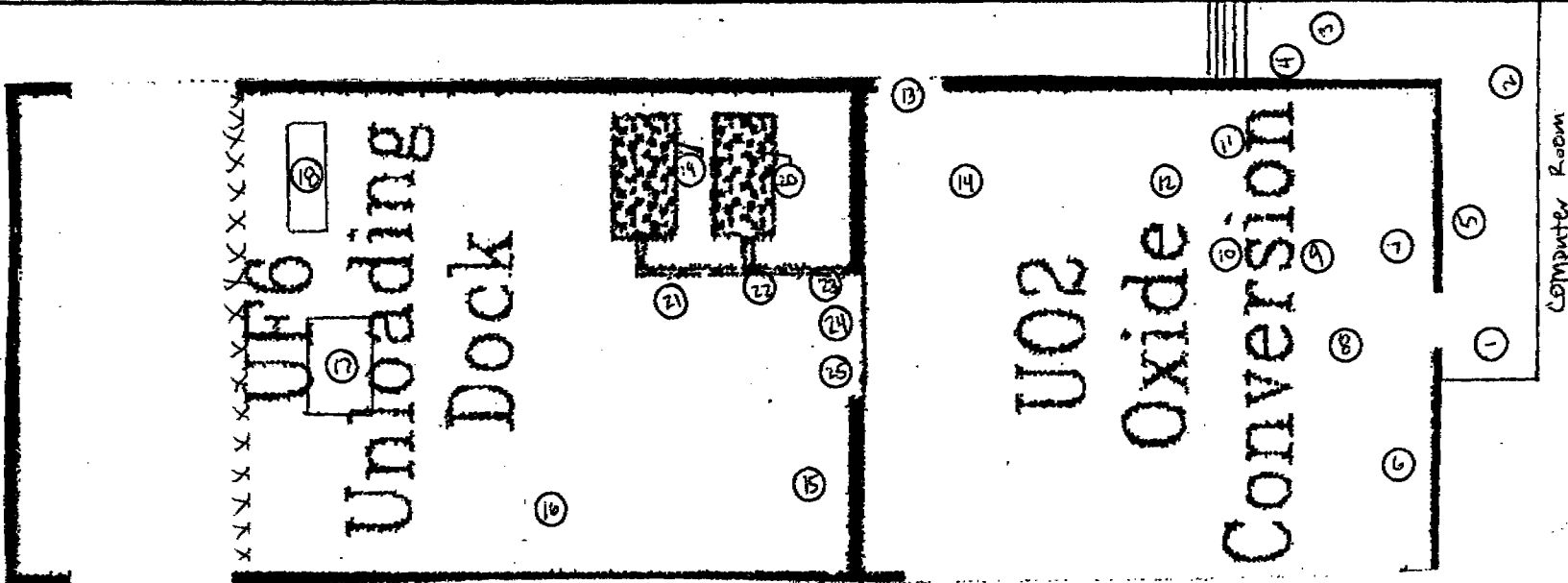
Revision: 0

Date: 5/6/04

Page: 18 of 28

RADIOLOGICAL SURVEY REPORT (Map)

CH-062804-05

SURVEY LOCATION: <u>260</u>		RWP: <u>1R-04-024.1</u>	Page <u>3</u> of <u>3</u>
LEGEND: (Fill in blank) <u>(4)</u> = Smear Location <u>N/A</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: <u>6/28/04</u>	TIME: <u>10:32</u>
			
REMARKS: <u>N/A</u>			
TECHNICIAN(S) SIGNATURE/DATE: <u>[Signature]</u> <u>6/28/04</u> <u>W. Clark Evers</u> <u>6/29/04</u>			
REVIEWER SIGNATURE/DATE: <u>[Signature]</u> <u>7-7-04</u>			

RADIOLOGICAL SURVEY REPORT

SURVEY LOCATION: BLD 240, 253, 254, 255, 256						RWP: IR-4024.0		Page 1 of 6						
PURPOSE OF SURVEY: CHARACTERIZATION						DATE: 6/23/04		TIME: 1000						
Instrument Type(s) (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)						
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)					
<input type="checkbox"/> Ludlum 2929/43-10	N/A	NA												
<input checked="" type="checkbox"/> Ludlum 2360/43-89 B	125	202404	207684	10/8/04	10/8/04	11.1	128	14.6	24.6					
<input type="checkbox"/> Ludlum 2221/44-9	15.5	NA												
<input checked="" type="checkbox"/> Micro-R D	N/A	205706	NA	10/8/04	NA									
Contamination Limits: (dpm/100cm ²)		Removable α 1000		Removable β 1000		Total α NA		Total β NA						
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	mR/hr or μR/hr
1	FLOOR	200	189	1295	500	372	1512							12
2	FLOOR	80	69	473	400	272	1106							14
3	FLOOR	250	239	1637	2500	2372	9642							32
4	FLOOR	600	589	4034	1500	1372	5577							28
5	DEWAXER	1000	989	6774	3500	3372	13707							50
6	FURNACE	400	389	2664	2500	2372	9642							30
7	GRINDER	500	489	3349	1333	1205	4898							340
8	FLOOR	600	589	4034	2000	1872	7610							8
9	FLOOR	NA	NA	NA	NA	NA	NA							40
REMARKS: REMOVABLE CONTAMINATION TAKEN WITH MASSLIN														
TECHNICIAN(S) SIGNATURE/DATE: [Signature] 6/23/04 N/A 1 N/A														
REVIEWER SIGNATURE/DATE: [Signature] 7-9-04														

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

Page: 17 of 26

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BLD 240, 253, 254, 255, 256												Page 2 of 6		
Contamination Limits: (dpm/100cm ²)			Removable α 1000 20 K/100cm ²			Removable β 1000 20 K/100cm ²			Total α NA			Total β NA		
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
10	FLOOR	350	339	2322	900	772	3138							45
11	FLOOR	900	889	6089	1000	872	3545							30
12	FLOOR	500	489	3349	1000	872	3545							50
13	PRESS	600	589	4034	1000	872	3545							70
14	POWDER UNLOADING STATION	11,000	10,989	75,267	12,000	11,872	48,260							100
15	FLOOR	300	289	1979	1200	1072	4358							24
16	HYDRAULIC UNIT	1000	989	6774	2000	1872	7610							30
17	FLOOR	100	89	610	1000	872	3545							130
18	COUNTER	200	189	1295	400	272	1106							40
19	FURNACE	300	289	1979	2000	1872	7610							20
20	FILTER PRESS	600	589	4034	4000	3872	15,740							150
21	INCINERATOR	2000	1989	13,623	4500	4372	17,772							200
22	FLOOR	450	439	3007	1600	1472	5983							10
23	FLOOR	500	489	3349	1000	872	3545							34
NA														NA

REMARKS: REMOVABLE CONTAMINATION TAKEN WITH MASSLIN

TECHNICIAN(S) SIGNATURE/DATE: *[Signature]* 16/23/04

REVIEWER SIGNATURE/DATE: *[Signature]* 17-3-04

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BLD 255		RWP: IR-04-024.0	Page 3 of 6
LEGEND: (Fill in blank) <u>#</u> = Smear Location <u>#</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/23/04	TIME: 1000

REMARKS: SMEARS TAKEN WITH MASSLIN

TECHNICIAN(S) SIGNATURE/DATE: <i>[Signature]</i> 16/23/04	N/A	1	N/A
REVIEWER SIGNATURE/DATE: <i>[Signature]</i> 17-9-04			

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

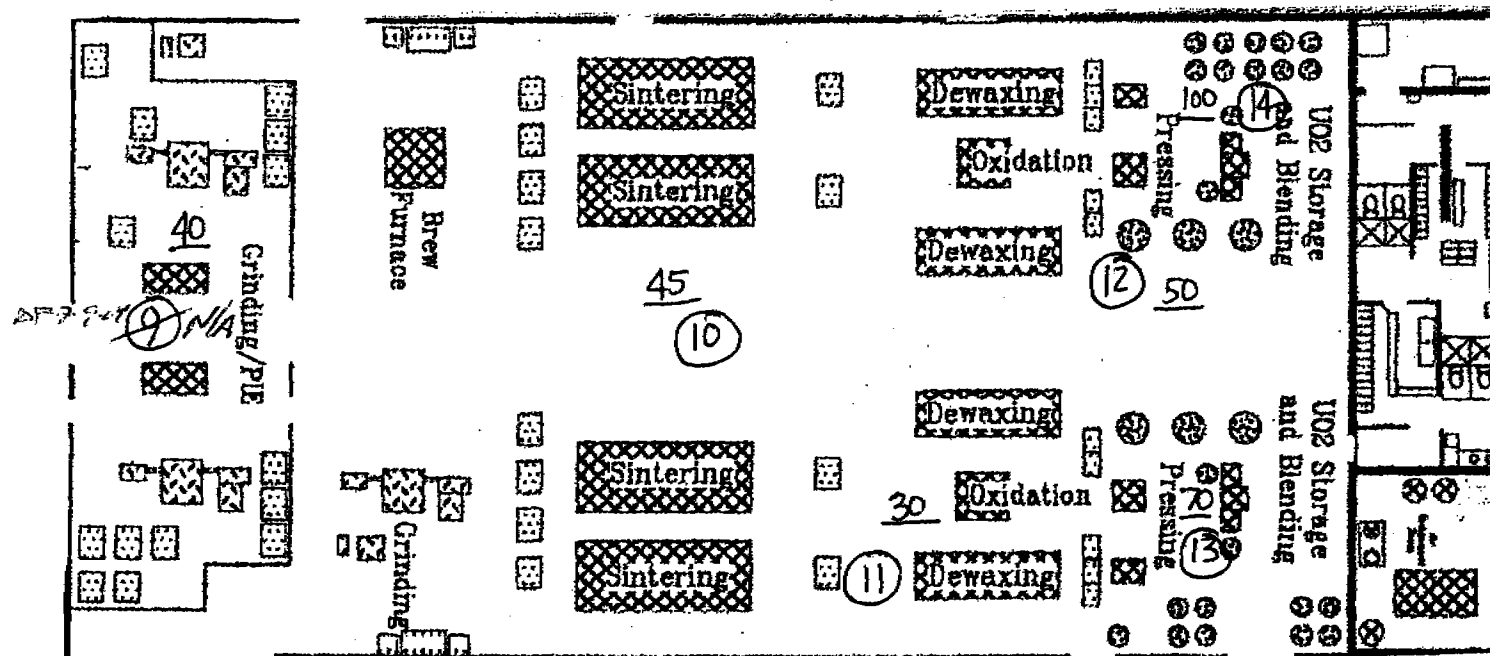
Date: 5/6/04

Page: 18 of 26

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BLD 254 RWP: IR-04-024.0 Page 4 of 6
 LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate ☐ mR/hr ☒ μ R/hr DATE: 6/23/04 TIME: 1000



REMARKS:

SMEARS TAKEN WITH MASSLIN

TECHNICIAN(S) SIGNATURE/DATE:

16/23/04

REVIEWER SIGNATURE/DATE:

1 7-9-04

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BLD 253		RWP: LR-04-024.0		Page 5 of 6	
LEGEND: (Fill in blank) # = Smear Location		# = G/A Dose Rate		DATE: 6/23/04 TIME: 1000	
REMARKS: SMEARS TAKEN WITH MASSLIN					
TECHNICIAN(S) SIGNATURE/DATE: <i>[Signature]</i> 6/23/04 N/A 1 N/A					
REVIEWER SIGNATURE/DATE: <i>[Signature]</i> 6/24/04 17-9-04					

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RECORD COPY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BLD 240		RWP: <i>Sc-4-024.0</i>	Page 6 of 6
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input checked="" type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: 6/23/04	TIME: 1000

REMARKS:
SMEARS TAKEN WITH MASSLIN

TECHNICIAN(S) SIGNATURE/DATE:	<i>[Signature]</i> 6/23/04	N/A	N/A
REVIEWER SIGNATURE/DATE:	<i>[Signature]</i> 7-7-04		

RADIOLOGICAL SURVEY REPORT

CH 062204-01

SURVEY LOCATION: BLOK 256 WAREHOUSE & STORAGE AREA RWP: N/A Page 1 of 4

PURPOSE OF SURVEY: CHARACTERIZATION DATE: 6/22/04 TIME: 1030

Instrument Type(s) (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10 <u>1</u>	N/A	<u>190615</u>	<u>207928</u>	<u>7/19/04</u>	<u>7/19/04</u>	<u>0.2</u>	<u>49</u>	<u>35.8</u>	<u>40.6</u>
<input type="checkbox"/> Ludlum 2360/43-89 <u>—</u>	125								
<input type="checkbox"/> Ludlum 2221/44-9 <u>—</u>	15.5								
<input type="checkbox"/> Micro-R <u>—</u>	N/A								

Contamination Limits: (dpm/100cm²)

Sample No.	Description/ Location	Removable α			Removable β			Total α			Total β			mR/hr or μR/hr
		Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	
1	<u>FLOOR (SEE MAP)</u>	<u>21</u>	<u>21</u>	<u>59</u>	<u>69</u>	<u>20</u>	<u><MDA</u>							
2		<u>6</u>	<u>6</u>	<u>17</u>	<u>55</u>	<u>6</u>								
3		<u>4</u>	<u>4</u>	<u><MDA</u>	<u>52</u>	<u>3</u>								
4		<u>6</u>	<u>6</u>	<u>17</u>	<u>56</u>	<u>7</u>								
5		<u>3</u>	<u>3</u>	<u><MDA</u>	<u>40</u>	<u>0</u>								
6		<u>8</u>	<u>8</u>	<u>22</u>	<u>56</u>	<u>7</u>								
7		<u>4</u>	<u>4</u>	<u><MDA</u>	<u>56</u>	<u>7</u>								
8		<u>3</u>	<u>3</u>	<u>↓</u>	<u>39</u>	<u>0</u>								
9		<u>6</u>	<u>6</u>	<u>17</u>	<u>60</u>	<u>11</u>								

REMARKS: N/A 43-10-1 1 MDA's: 132, 988

TECHNICIAN(S) SIGNATURE/DATE: John Wolfe 6/22/04 N/A 1 N/A

REVIEWER SIGNATURE/DATE: W. J. 2 Flg 7-9-04

Title: Radiological Monitoring

RECORD COPY

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BLDG 256 WAREHOUSE & STORAGE AREA													Page 2 of 4	
Contamination Limits: (dpm/100cm ²)			Removable α 1000			Removable β 1000			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
10	FLOOR (SEE MAP)	4	4	<MDA	52	3	<MDA							
11		6	6	17	50	1								
12		8	8	22	53	4								
13		4	4	<MDA	57	8								
14		1	1		62	13								
15		3	3	↓	49	0								
16		8	8	22	48	0								
17		5	5	<MDA	59	10								
18		6	6	17	58	9								
19		4	4	<MDA	49	0								
20		3	3		48	0								
21		3	3		54	5								
22		1	1		52	3								
23		1	1		39	0								
24	↓	4	4	↓	41	0	↓							

REMARKS: N/A

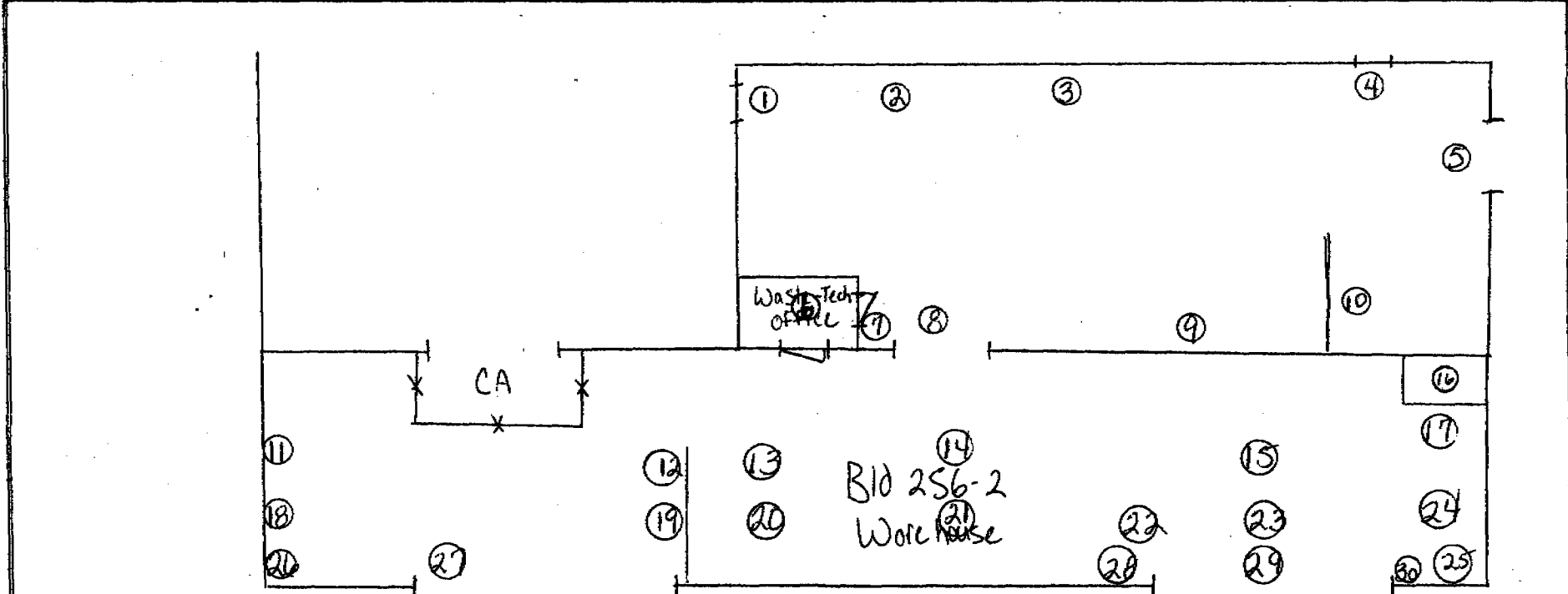
TECHNICIAN(S) SIGNATURE/DATE: *John Wolfe* 1 6/22/04

REVIEWER SIGNATURE/DATE: *BB2 FB* 1 7-9-04

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BLDG 256 WAREHOUSE + STORAGE AREA	RWP: N/A	Page 4 of 4
LEGEND: (Fill in blank) \oplus = Smear Location <u>N/A</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: 6/22/04 TIME: 1030



REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *John Wolfe* 16/22/04

REVIEWER SIGNATURE/DATE: *David F. 17.9.04*

CONFIDENTIAL ONLY

RADIOLOGICAL SURVEY REPORT

CH-060904-05

SURVEY LOCATION: <u>Womens Locker Room</u>						RWP: <u>1R-04-024</u>		Page 1 of 4						
PURPOSE OF SURVEY: <u>Determine removable contam. status of former CA</u>						DATE: <u>6/9/04</u>		TIME: <u>1330</u>						
Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)						
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)					
<input checked="" type="checkbox"/> Ludlum 2929/43-10 <u>1</u>	N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6					
<input checked="" type="checkbox"/> Ludlum 2360/43-89 <u>2</u>	125	202469	212724	10/30/04	10/30/04	.1	110	14.4	22.7					
<input type="checkbox"/> Ludlum 2221/44-9 <u>—</u>	15.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
<input type="checkbox"/> Micro-R <u>—</u>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A					
Contamination Limits: (dpm/100cm ²)		Removable α <u>1000</u>		Removable β <u>1000</u>		Total α <u>5000</u>		Total β <u>5000</u>						
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
1	Light 1	2	1.8	5	35	0	0	N	A	A	N	A	A	
2	Light 2	6	5.8	16	51	2	5							
3	Light 3	1	.8	2	48	0	0							
4	Vent 3	24	23.8	66	51	2	5							
5	Vent 2	204	203.8	569	205	156	384							
6	Vent 1	7	6.8	19	51	2	5							
7	Speaker 1	4	3.8	11	44	0	0							
N/A	N/A													
N/A	N/A													
REMARKS: 43-89 Area BKgd 2cpm α / 140cpm β Area BKgd used to calculate dpm														
43-10 daily BKgd .1cpm α / 50dpm β														
TECHNICIAN(S) SIGNATURE/DATE: <u>Jm [Signature]</u> <u>1 4/9/04</u> <u>[Signature]</u> <u>1 6-9-04</u>														
REVIEWER SIGNATURE/DATE: <u>W. Clark [Signature]</u> <u>6/22/04</u>														

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: <u>WOMEN'S LOCKER RM</u>		RWP: <u>IR-04-024</u>	Page <u>2</u> of <u>4</u>
LEGEND: (Fill in blank) <u>△</u> = <u>SMALL AREA</u> = Smear Location <u> </u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μR/hr		DATE: <u>6-9-04</u>	TIME: <u>1330</u>

WOMEN'S LOCKER ROOM FLOOR

REMARKS: LAS'S TAKEN AT LOCATIONS 1-6. RESULTS USING 43-89

1) 24 cpm α / 218 cpm β 2) 40 cpm α / 160 cpm β 3) 24 cpm α / 220 cpm β 4) 20 cpm α / 138 cpm β
5) 18 cpm α / 344 cpm β 6) 30 cpm α / 138 cpm β

TECHNICIAN(S) SIGNATURE/DATE: [Signature] 16/9/04 [Signature] 16-9-04

REVIEWER SIGNATURE/DATE: W. Clark Ewing 16/22/04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: WOMEN'S LOCKER ROOM

RWP: 112-04-024

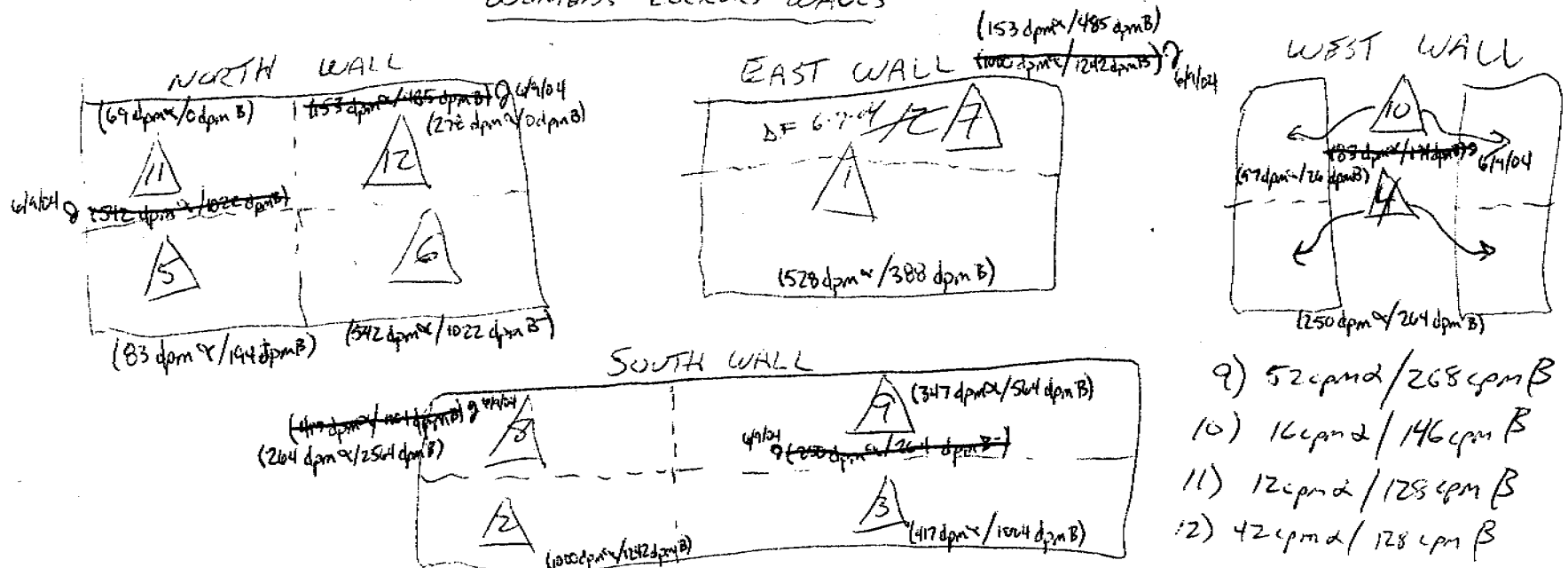
Page 3 of 4

LEGEND: (Fill in blank) Δ = Smear Location _____ = G/A Dose Rate \square mR/hr \square μ R/hr

DATE: 6-7-04

TIME: 1330

WOMEN'S LOCKER WALLS



REMARKS: 1) 78 cpm α / 228 cpm β 2) 146 cpm α / 422 cpm β 3) 62 cpm α / 368 cpm β 4) 38 cpm α / 200 cpm β 5) 14 cpm α / 134 cpm β 6) 80 cpm α / 372 cpm β 7) 24 cpm α / 250 cpm β

TECHNICIAN(S) SIGNATURE/DATE: [Signature] 6/9/04

REVIEWER SIGNATURE/DATE: [Signature] 6/22/04

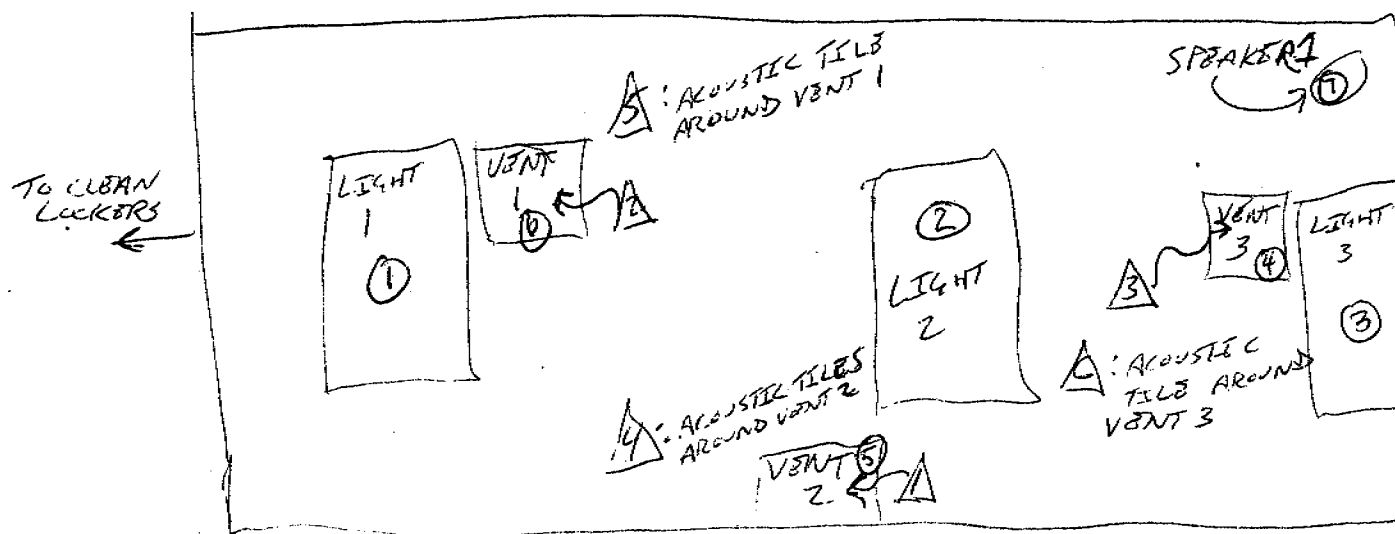
Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: <u>WOMEN'S LOCKER ROOM</u>	RWP: <u>IR-04-024</u>	Page <u>4</u> of <u>4</u>
LEGEND: (Fill in blank) Δ = ^{large area} Smear Location _____ = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: <u>6-9-04</u> TIME: <u>1330</u>

\bigcirc Smear location
(see cover sheet)

WOMEN'S LOCKER ROOM CEILING



1583 dpm α / 44 dpm β

REMARKS: 1) 3.26 cpm α / 490 B(cpm) 2) 100 α cpm / 288 B cpm 3) 86 α cpm / 150 B cpm
 (2250 dpm α / 1542 dpm B) (681 dpm α / 652 dpm B) (614 dpm α / 44 dpm B)
 4) 38 cpm α / 202 cpm B (1250 dpm α / 223 dpm B) 5) 14 cpm α / 152 cpm B (86 dpm α / 53 dpm B) 6) 8722 cpm α / 944 cpm B (242 dpm α / 10 dpm B)

TECHNICIAN(S) SIGNATURE/DATE: [Signature] 6/9/04
 REVIEWER SIGNATURE/DATE: W. [Signature] 6/22/04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT

Page 1 of 3

SURVEY LOCATION: Bldg 253 Room 1 Floor 1

RWP: N/A

PURPOSE OF SURVEY: characterization

DATE: 06/09/04

TIME: 1200

Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10 L	N/A	190615	207926	7/19/04	7/19/04	0.2	49	35.6	40.6
<input type="checkbox"/> Ludlum 2360/43-89	125	N/A							
<input type="checkbox"/> Ludlum 2221/44-9	15.5	N/A							
<input type="checkbox"/> Micro-R	N/A	N/A							

Contamination Limits: (dpm/100cm²)

Removable α 1000

Removable β 1000

Total α N/A

Total β N/A

Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	mR/hr or μR/hr
		Removable	Removable	Removable	Removable	Removable	Removable	Total	Total	Total	Total	Total	Total	
1	Wall 4 Section 1	2	2	<1000	37	0	<1000							
2	Wall 4 Section 2	4	4	<1000	43	0	<1000							
3	Wall 2	6	6	<1000	40	0	<1000							
4	Window	3	3	<1000	46	0	<1000							
5	Wall 3	5	5	<1000	41	0	<1000							
6	Wall 4 Section 1	4	4	<1000	36	0	<1000							
7	Wall 4 Section 2	1	1	<1000	45	0	<1000							
8	Room Air Intake Vent	2	2	<1000	51	2	<1000							
9	Room Air Out Vent	4	4	<1000	41	0	<1000							

REMARKS:

N/A

TECHNICIAN(S) SIGNATURE/DATE: Veronica L. Smith 6/09/04

N/A

N/A

REVIEWER SIGNATURE/DATE: Mark P. Smith 6-9-04

N/A

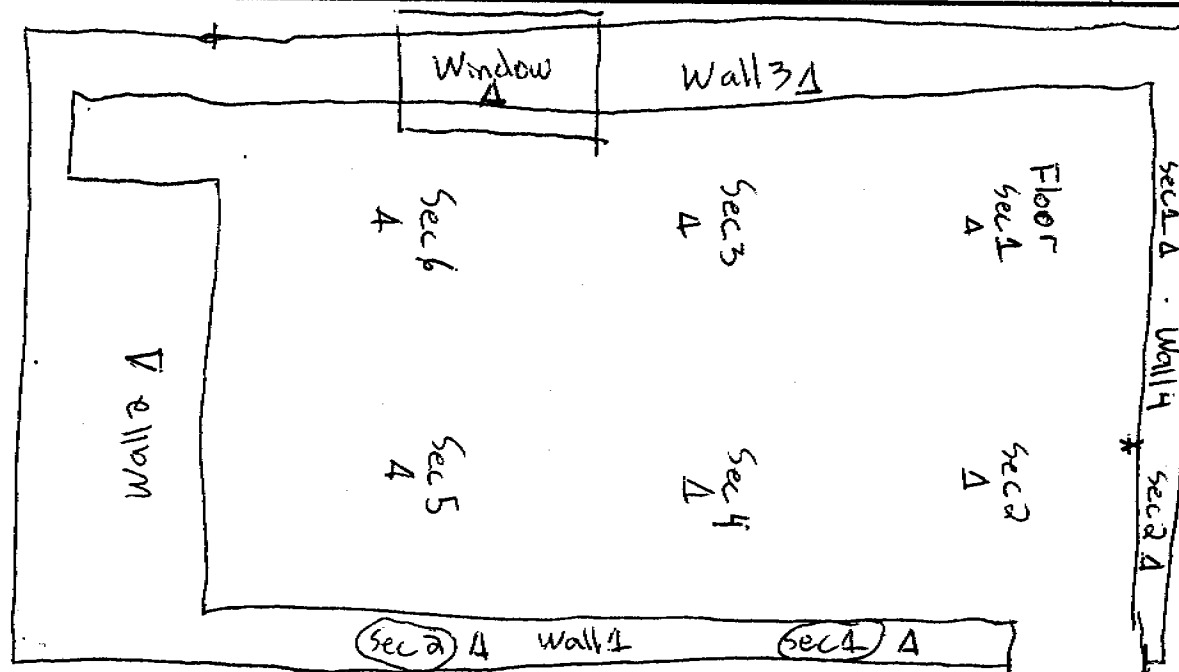
RADIOLOGICAL SURVEY REPORT (Supplement)[illegible]

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

FOR INFORMATION ONLY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bldg 253 Room 4F		RWP: N/A	Page 3 of 3
LEGEND: (Fill in blank) Δ = Smear Location N/A = G/A Dose Rate \square mR/hr \square μ R/hr		DATE: 06/09/04	TIME: 1200



REMARKS:

* Room Intake vent

TECHNICIAN(S) SIGNATURE/DATE:	<i>[Signature]</i> / 6/09/04	N/A	N/A
REVIEWER SIGNATURE/DATE:	<i>[Signature]</i> / 6-9-04	N/A	N/A

RADIOLOGICAL SURVEY REPORT

RECORDED

CH-062304-02
SURVEY LOCATION: Bld 253, 254, + 256 RWP: IR-04-024.0 Page 1 of 6

PURPOSE OF SURVEY: Characterization of work area DATE: 6/23/04 TIME: 1430

Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10 <u>1</u>	N/A	190615	207928	7/19/04	7/19/04	0.2	49	35.8	40.6
<input type="checkbox"/> Ludlum 2360/43-89 <u> </u>	125					A			
<input type="checkbox"/> Ludlum 2221/44-9 <u> </u>	15.5				N				
<input checked="" type="checkbox"/> Micro-R <u>D</u>	N/A	205706	N/A	10/8/04	N/A		N/A		

Contamination Limits: (dpm/100cm ²)			Removable α <u>20 k</u>			Removable β <u>20 k</u>			Total α <u>N/A</u>			Total β <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	mR/hr or μR/hr
		Removable	Removable	Removable	Removable	Removable	Removable	Total	Total	Total	Total	Total	Total	
1	Bld 254 Floor	41	41	114	54	5	<MDA							20
2		60	60	168	83	34	↓							↓
3		116	116	324	108	59	145							
4		75	75	210	75	26	<MDA							
5		53	53	148	66	17	↓							↓
6		149	148	427	139	90	222			N				50
7		55	55	154	65	16	<MDA							100
8		46	46	128	66	17	↓							40
9		93	93	260	85	36	89							110

REMARKS: For 43-10; MDA = 13α, 88β.

DF 7-7-04

TECHNICIAN(S) SIGNATURE/DATE: [Signature] 16/23/04 W. Clark Emsw. 16/23/04REVIEWER SIGNATURE/DATE: [Signature] 1 7-7-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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CH-062304-01

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bld 253, 254, + 256													Page 2 of 6	
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
10	Bld 254 Floor	60	60	168	78	29	77-400	Δ = 77-4						250
11		63	63	292	84	35	<MDA							↓
12		131	131	366	112	63	155							↓
13		98	98	274	81	32	<MDA							100
14		138	138	385	109	60	147							↓
15		208	208	581	160	111	273							↓
16		87	87	243	95	46	113							↓
17		100	100	279	93	47	116	108			A			↓
18	↓	107	107	299	98	49	121			N				↓
19	Bld 256-1 Floor	124	124	346	109	60	148							200
20	↓	36	36	101	71	22	<MDA							15
21	Bld 253 Floor	33	33	189	41	0								↓
22	↓	62	62	173	56	7								↓
23	↓	38	38	106	51	2								↓
24	↓	61	61	170	71	22	↓							20

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: G. J. [Signature] / 6/23/04

REVIEWER SIGNATURE/DATE: W. Clark [Signature] / 6/23/04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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CH-062304-61

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BID 253, 254, + 256												Page 3 of 6		
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
25	BID 253 Floor	106	106	296	88	39	96							20
26		42	42	117	60	11	<MDA							↓
27		97	97	271	73	24								↓
28	(572)	68	68	190	78	29	↓							50
29		205	205	1027	163	114	281							↓
30		62	62	173	82	33	<MDA							↓
31		52	52	145	67	18								20
32		42	42	117	80	31								↓
33		27	27	75	55	6								↓
34		48	48	134	70	21								↓
35		41	41	115	77	28								↓
36		59	59	165	78	29								↓
37		54	54	151	74	25								↓
38		56	56	156	75	26	↓							↓
39	↓	75	75	209	97	48	239	118						↓

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: G. J. O'Connell / 6/23/04 W. Mark Erwin / 6/23/04

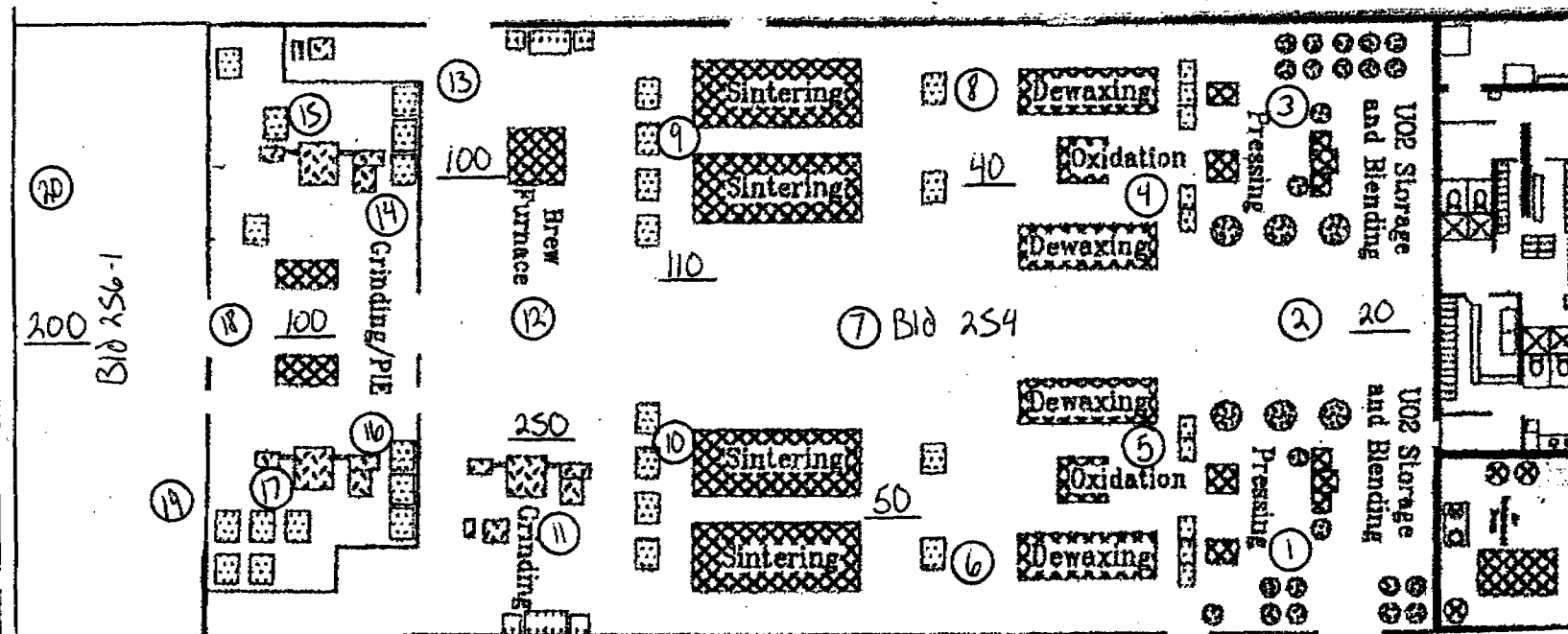
REVIEWER SIGNATURE/DATE: DEB 273 / 7-7-04

CH-062304-01

CH-062304-01

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bld 253, 254, + 256	RWP: IR-04-024.0	Page 5 of 6
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/23/04 TIME: 1430



REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: J. [Signature] 6/23/04 W. [Signature] 6/23/04

REVIEWER SIGNATURE/DATE: D. [Signature] 7-7-04

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

CH-062304-01

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bld 253, 254, + 256		RWP: IR-04-024.0	Page 6 of 6
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/23/04	TIME: 1430

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: <i>Gm Geo</i> 6/23/04	<i>W. Clark Evans</i> 6/23/04
REVIEWER SIGNATURE/DATE: <i>W. Clark Evans</i> 7-7-04	

CH-062404-01

RADIOLOGICAL SURVEY REPORT

SURVEY LOCATION: Bld 240, 255, +260

RWP: IR-04-024.1

Page 1 of 12

PURPOSE OF SURVEY: Characterization of work area

DATE: 6/24/04

TIME: 1400

Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10 1	N/A	190615	207928	7/19/04	7/19/04	0.2	49	35.8	40.6
<input type="checkbox"/> Ludlum 2360/43-89	125					A			
<input type="checkbox"/> Ludlum 2221/44-9	15.5				N				
<input checked="" type="checkbox"/> Micro-R D	N/A	205706	N/A	10/8/04	N/A			NA	

Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
1	Bld 240 Floor	76	76	212	90	41	101							10
2		85	85	237	109	60	148							
3		104	104	290	108	59	145							
4		9	9	25	57	8	20							
5		68	68	189	85	36	89							
6		106	106	296	102	53	131							
7		80	80	223	82	33	81							
8		32	32	89	54	5	12							
9		48	48	134	65	16	34							

REMARKS: For 43-10: MDA = 13 α, 88 β.

TECHNICIAN(S) SIGNATURE/DATE: [Signature] 6/24/04

REVIEWER SIGNATURE/DATE: [Signature] 7-9-04

W. Clark Evers 6/24/04

RADIOLOGICAL SURVEY REPORT (Supplement)

Page 2 of 12

SURVEY LOCATION: BID 240, 255, + 260

Contamination Limits: (dpm/100cm²)Removable α 20KRemovable β 20KTotal α N/ATotal β N/A

Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
10	BID 240 Floor	46	46	128	78	29	75							10
11		70	70	195	66	17	42							↓
12		60	60	167	79	30	74							↓
13		94	94	262	103	54	133							400
14		354	354	988	234	185	456							↓
15		125	125	349	133	84	207							↓
16		64	64	178	88	39	96							30
17		84	84	234	91	42	103							↓
18		383	383	1069	358	309	761							100
19		297	297	829	222	173	426							30
20		63	63	175	93	44	108							↓
21		36	36	100	65	16	39							100
22*		N/A			N/A									↓
23		97	97	270	112	63	155							↓
24		79	79	220	78	29	71							↓

REMARKS: * Smear # 22 was lost and therefore not counted.

TECHNICIAN(S) SIGNATURE/DATE:

Jm 200

1 6/24/04

W. Clark Evers 1 6/24/04

REVIEWER SIGNATURE/DATE:

Rm 2 Fb

1 7-9-04

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BID 240, 255, + 260												Page 3 of 12			
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable By 20K			Total α N/A			Total By N/A			
Sample No.	Description/ Location		Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM By Removable	Net CPM By Removable	dpm/100cm ² By Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM By Total	Net CPM By Total	dpm/100cm ² By Total	mR/hr or μ R/hr
25	BID 240 Floor		55	55	153	84	35	86							100
26			36	36	100	66	17	43							
27			128	128	357	105	56	138							
28			107	107	298	113	64	158							
29			110	110	307	89	40	99							200
30			50	50	139	71	22	54							
31	BID 255 Floor		91	91	254	96	47	116							40
32			42	42	117	59	10	25							
33			143	143	399	119	70	172							
34			118	118	329	90	41	101							
35			65	65	181	96	47	116							
36			136	136	379	136	87	214							20
37			145	145	404	130	81	200							150
38*			2384	2383	16211	2157	2044	7892							
39			83	83	231	115	66	163							

REMARKS: * Smear # 38 was counted using 43-89 H, Bkg = 1 α , 113 β , EFF = 14.7 α , 25.9 β , mDA = 35 α , 162 β .

TECHNICIAN(S) SIGNATURE/DATE: G. S. [Signature] 1 6/24/04

W. Clark Evers 1 6/24/04

REVIEWER SIGNATURE/DATE: [Signature] 1 7-9-04

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BID 240, 255, + 260												Page 4 of 12		
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
40	Grinder	685	685	1913	621	572	1409							150
41	Sample Hood	246	246	687	206	157	387							↓
42	BID 255 w/ 6/24/04 255 Floor	100	100	279	332	283	697							40
43		148	148	413	145	96	236							↓
44		94	94	262	91	42	103							20
45		153	153	427	134	85	209							↓
46		38	38	106	84	35	86							↓
47		294	294	821	287	238	586							↓
48		170	170	474	159	110	271							↓
49		140	140	391	113	64	158							36
50		120	120	335	117	68	167							↓
51		291	291	812	235	186	458							20
52		91	91	254	112	63	155							↓
53		158	158	441	167	118	291							↓
54		134	134	374	144	95	234							↓

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *[Signature]* 6/24/04 W. Clark Evers 6/24/04

REVIEWER SIGNATURE/DATE: *[Signature]* 7-9-04

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: B10 240, 255, + 260

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Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
55	B10 255 Floor	133	133	371	118	69	170	/						40
56		139	139	388	138	89	219							
57		62	62	173	76	27	67							
58		277	277	773	219	170	419							
59		299	299	835	230	181	446							
60		176	176	491	138	89	219							30
61		65	65	181	74	25	62 < 104							20
62		56	56	156	78	29	271							
63		62	62	173	83	34	84							
64		61	61	170	72	23	57							
65		60	60	167	85	36	89							
66	B10 260 Floor	24	24	66	51	2	52 < 104							30
67		50	50	139	76	27	67							
68		9	9	25	45	0	0							
69		635	635	1773	542	493	1214							

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE:

Jm 2/2/04

6/24/04

W. Clark Erue 6/24/04

REVIEWER SIGNATURE/DATE:

Jm 2/2/04

7-7-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BID 240, 255, + 260												Page 6 of 12		
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
70	BID 260 Floor	75	75	209	80	31	76<MDA							40
71		107	107	298	104	55	135							
72		119	119	332	110	61	150							
73		158	158	441	187	138	340							
74		133	133	371	165	116	286							
75		89	89	248	89	40	99							↓
76		39	39	108	59	10	25<MDA				A			60
77		35	35	97	58	9	22				N			↓
78		33	33	92	58	9	22							↓
79		269	269	751	246	197	495							200
80		72	72	201	82	33	58<MDA							↓
81	Vent hood	47	47	131	54	57	122							↓
82	BID 260 Floor	93	93	259	113	64	158							30
83		74	74	206	89	40	99							↓
84		91	91	254	90	41	101							↓

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *[Signature]* 6/24/04 W. Clark Evers 6/24/04

REVIEWER SIGNATURE/DATE: *[Signature]* 7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: BID 240, 255, + 260											Page 7 of 12				
Contamination Limits: (dpm/100cm ²)				Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr	
85	BID 260 Floor	69	69	192	90	41	101							30	
86	BID 260 2nd Floor	186	186	519	164	115	283							20	
87		232	232	647	196	147	362								
88		106	106	246	114	65	160								
89		737	737	2058	589	540	1930								
90		47	47	131	67	18	44								
91	BID 260 3rd Floor	77	77	215	86	37	91								
92		81	81	226	101	52	129								
93		157	157	438	125	76	187								
94*		1302	1302	3636	1149	1100	2709								
95		159	159	444	137	89	217								
96	BID 260 4th Floor	134	134	374	125	76	187								
97		179	179	499	152	103	254								
98		411	411	1147	292	243	599								
99		328	328	916	1017	968	2384								

REMARKS: * Smear # 94 was counted using 43-89 H.

TECHNICIAN(S) SIGNATURE/DATE: Jim [Signature] / 6/24/04

REVIEWER SIGNATURE/DATE: W. Clark [Signature] / 6/24/04

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ATTACHMENT 1

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: B10 240, 255, +260		RWP: IR-04-024.1		Page 9 of 12
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/24/04		TIME: 1400

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *[Signature]* 6/24/04 W. Clark Crew 6/24/04

REVIEWER SIGNATURE/DATE: *[Signature]* 7-7-04

SURVEY LOCATION: Bld 240, 255, + 260		RWP: IR-04-024.1	Page 10 of 12
LEGEND: (Fill in blank) <u>⊕</u> = Smear Location <u>#</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μR/hr		DATE: 6/24/04	TIME: 1400

Bld 255

REMARKS:	N/A
TECHNICIAN(S) SIGNATURE/DATE:	<i>[Signature]</i> 6/24/04 <i>[Signature]</i> 6/24/04
REVIEWER SIGNATURE/DATE:	<i>[Signature]</i> 7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

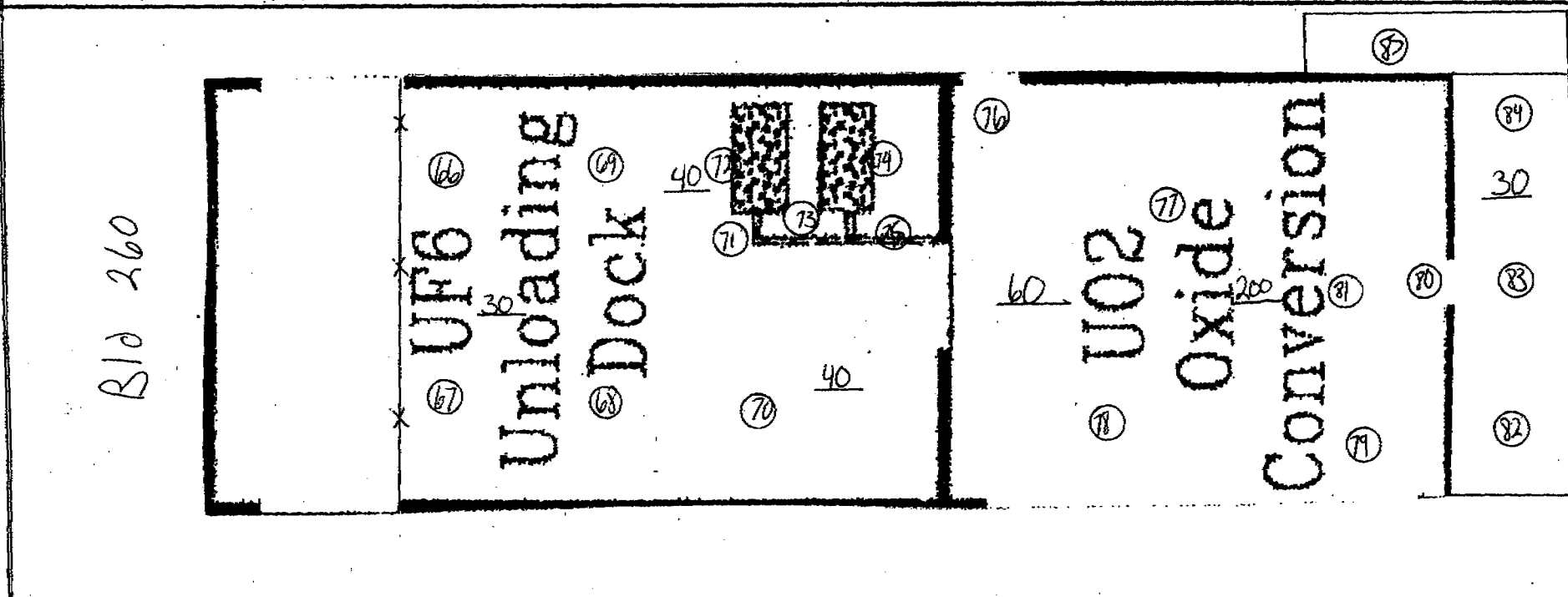
Date: 5/6/04

Page: 18 of 28

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bld 240, 255, & 260 RWP: IR-04-024.1 Page 11 of 12
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate ☐ mR/hr ☒ μ R/hr DATE: 6/24/04 TIME: 1400



REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE:

[Signature]

6/24/04

W. Chris Evans 6/24/04

REVIEWER SIGNATURE/DATE:

[Signature]

6/24/04

Title: Radiological Monitoring			
Procedure: LVI-HP-11	Revision: 0	Date: 5/6/04	Page: 18 of 26

RECORD COPY

RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bld 240, 255, + 260		RWP: IR-04-024.1	Page 12 of 12
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/24/04	TIME: 1400

Bld 260 2nd Floor	Bld 260 3rd Floor	Bld 260 4th Floor

REMARKS: N/A
TECHNICIAN(S) SIGNATURE/DATE: <i>[Signature]</i> 6/24/04
REVIEWER SIGNATURE/DATE: <i>[Signature]</i> 7-9-04

RADIOLOGICAL SURVEY REPORT

CH-062504-02

SURVEY LOCATION: Bldg 240						RWP: 1R-04-024.1		Page 1 of 8						
PURPOSE OF SURVEY: Characterization of equipment						DATE: 6/25/04		TIME: 1200						
Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)						
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)					
<input checked="" type="checkbox"/> Ludlum 2929/43-10 1	N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6					
<input checked="" type="checkbox"/> Ludlum 2360/43-89 B	125	202404	207684	10/8/04	10/8/04	11.1	128	14.6	24.6					
<input type="checkbox"/> Ludlum 2221/44-9	15.5					A								
<input type="checkbox"/> Micro-R	N/A				N									
Contamination Limits: (dpm/100cm ²)			Removable α 20K		Removable β 20K		Total α N/A		Total β N/A					
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
1	Instrument	97	97	271	84	35	9500	9500	1489	52K	8500	8372	27K	N/A
2	Desk	23	23	64	60	11	<MDA							
3	↓	19	19	53	68	19								
4	↓	24	24	67	58	9								
5	Desk	16	16	45	44	0					A			
6	Counter Top	49	49	137	52	3					N			
7	↓	46	46	128	57	8								
8	↓	18	18	50	44	0								
9	↓	27	27	75	42	0								
REMARKS: For 43-10: MDA = 132/888 For 43-89 B: MDA = 287/1039 6/25/04														
TECHNICIAN(S) SIGNATURE/DATE: <u>[Signature]</u> 16/25/04 N/A 1 N/A														
REVIEWER SIGNATURE/DATE: <u>[Signature]</u> 17-9-04														

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 240												Page 2 of 8		
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable βy 20K			Total α N/A			Total βy N/A		
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM βy	Net CPM βy	dpm/100cm ² βy	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM βy	Net CPM βy	dpm/100cm ² βy	mR/hr or μR/hr
		Removable	Removable	Removable	Removable	Removable	Removable	Total	Total	Total	Total	Total	Total	
10	Counter Top	27	27	75	50	1	4MDA							
11	↓	32	32	89	61	12	1							
12	↓	10	10	105	46	0	↓							
13	Lab Equipment Vent	254	254	709	291	242	596							
14	Lab Equipment	10	10	28	45	0	4MDA							
15	Counter top	20	20	56	61	12	1							
16	↓	17	17	47	56	7	1							
17	Lab Equipment	25	25	70	51	2	1							
18	Counter Top	98	98	274	79	30	1							
19	↓	28	28	78	76	27	1							
20	↓	18	18	50	65	16	1							
21	Hood	44	44	123	77	28	1							
22	↓	38	38	106	60	11	1							
23	↓	22	22	61	64	15	1							
24	Door	16	16	45	48	0	↓							

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *Sm 200* / 6/15/04 N/A

REVIEWER SIGNATURE/DATE: *And 200* / 7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bld 240												Page 3 of 8		
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
25	Floor	51	51	142	91	42	103							
26	Furnace Coffins	179	179	499	161	112	276							
27		457	457	1276	329	280	690							
28		345	345	963	334	285	702							
29		555	555	1550	466	417	1027							
30		212	212	592	151	102	251							
31		281	281	784	222	173	426							
32	↓	2	2	<MDA	17	0	<MDA							
33	Furnace	168	168	469	150	101	249							
34	↓	140	140	391	149	100	246							
35	↓	201	201	561	180	131	323							
36	↓	215	215	600	266	217	534							
37	Elevated Deck	606	606	1692	449	400	985							
38	Electrical Panel	446	446	1245	344	295	727							
39	Equipment	409	409	1142	266	217	534							

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: *On 209* 1 6/25/04 N/A 1 N/A

REVIEWER SIGNATURE/DATE: *Wend 276* 1 7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: B10 240												Page 4 of 8			
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>			
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr	
40	Storage Tank	1743	1743	4868	1493	1444	3557								
41	↓	159	159	444	123	74	182								
42	Door	206	206	575	129	80	197								
43	Hood	1510	1510	4217	1387	1338	3296								
44	↓	99	99	276	133	84	207								
45	Electrical Panel	1757	1757	4907	2284	2235	5505								
46	Equipment	127	127	354	106	57	140								
47	↓	70	70	195	72	23	<MDA								
48	↓	48	48	134	86	37	91								
49	↓	39	39	108	74	25	<MDA								
50	↓	108	108	301	120	71	175								
51	Top Cart	328	328	916	243	194	478								
52	↓	268	268	748	213	164	404								
53	Equipment	83	83	231	78	29	<MDA								
54	↓	56	56	156	80	31	<MDA								

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: Sm 200 / 6/25/04 N/A / N/A

REVIEWER SIGNATURE/DATE: Rev 276 / 7-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 240												Page 5 of 8		
Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μ R/hr
55	Equipment	20	20	55	63	14	<MDA							
56		308	308	860	206	157	387							
57		247	247	689	222	173	426							
58		86	86	240	82	33	<MDA							
59	Hood	367	367	1025	242	193	475							
60		445	445	1242	276	227	559							
61	Computer	138	138	385	114	65	160							
* 62	Watt 6/25/04 Incinerator	3183	3183	21.7K	3380	3331	13.2K							
63	Equipment	591	591	1650	434	385	948							
64		2361	2361	6594	1538	1489	3667							
65		2882	2882	8050	1755	1706	4202							
66		280	280	782	202	153	377							
67		385	385	1075	267	218	537							
68		223	223	622	197	148	365							
69		591	591	1650	434	385	948							

REMARKS: * Counted on 43-89 B 6/25/04

TECHNICIAN(S) SIGNATURE/DATE: J. G. 108 1 6/25/04 N/A 1 N/A

REVIEWER SIGNATURE/DATE: J. 2 F. 1 89-04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: B10 240												Page 6 of 8			
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>			
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr	
70	Electrical Panel	620	620	1731	538	489	1204	<div style="display: flex; align-items: center; justify-content: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">N/A</div> <div style="margin: 0 10px;">= 7.9.04</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">N/A</div> </div>							
71	Tools	168	168	469	260	211	520								
72	Desk	34	34	94	59	10	<MDA								
73	Wall	39	39	108	76	17	1								
74	Desk	32	32	89	48	0	↓								
75	Door	16	16	44	53	4	↓								
76	Vent	278	278	777	257	208	512								
77	↓	48	48	134	67	18	14								
78	Equipment	152	152	425	142	93	229								
79	Tool Cart	133	133	372	170	121	298								
80	↓	14	14	39	60	11	<MDA								
81	↓	115	115	321	133	84	207								
82	Band Saw	13	13	36	45	0	<MDA								
83	Door	11	11	30	48	0	↓								
84	Equipment	48	48	134	275	28	↓								
REMARKS:		<div style="display: flex; justify-content: space-between;"> N/A 6/25/04 6/25/04 </div>													
TECHNICIAN(S) SIGNATURE/DATE:		<div style="display: flex; justify-content: space-between;"> <i>[Signature]</i> 6/25/04 N/A </div>													
REVIEWER SIGNATURE/DATE:		<div style="display: flex; justify-content: space-between;"> <i>[Signature]</i> 7-7-04 </div>													

SURVEY LOCATION: Bldg 240

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N/A

On 2/22

1. 6/25/04

N/A

N/A

REVIEWER SIGNATURE/DATE:

275

17-9-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: BID 240		RWP: IR-04-024.1		Page 9 of 9	
LEGEND: (Fill in blank) (#) = Smear Location # = G/A Dose Rate <input type="checkbox"/> mR/hr <input checked="" type="checkbox"/> μ R/hr		DATE: 6/25/04		TIME: 1200	
<p>The map shows a floor plan of a radiological facility. Rooms include: Laboratory (left), HP (left), Laundry (top center), Dry Recovery (center), Wet Recovery (center), Incinerator and Scrubber (center), Gammaray Counter (center), and Maintenance Shop (right). A HEPA ROOM is located at the bottom center. Numerous numbered circles (1-94) are placed throughout the facility, indicating survey points. Some points are marked with a '#' symbol, indicating G/A Dose Rate measurements. The map also shows various pieces of equipment and furniture within the rooms.</p>					
REMARKS:					
TECHNICIAN(S) SIGNATURE/DATE: <i>[Signature]</i> 6/25/04 NA / NA					
REVIEWER SIGNATURE/DATE: <i>[Signature]</i> 6-29-04					

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT

SURVEY LOCATION: Bldg 254 & 256

RWP: IR-04-024.1

Page 1 of 5

PURPOSE OF SURVEY: Characterization Survey

DATE: 6/28/04

TIME: 9:55 AM '04

Instrument Type(s): (√ if used)	Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)		Efficiency (%)	
		meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)
<input checked="" type="checkbox"/> Ludlum 2929/43-10-1	N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6
<input checked="" type="checkbox"/> Ludlum 2360/43-89-I	125	202430	212719	11/3/04	11/3/04	3.9	90	13.7	21.9
<input type="checkbox"/> Ludlum 2221/44-9	15.5					A			
<input type="checkbox"/> Micro-R	N/A				N				

Contamination Limits: (dpm/100cm ²)			Removable α 20K			Removable β 20K			Total α N/A			Total β N/A		
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	mR/hr or μR/hr
1	Hopper	134	134	374	111	62	153							
2	Hood	1217	1217	3399	821	772	1901							
3	↓	323	323	902	206	157	387							
4	Equipment	203	203	567	131	82	202							
5	Vent	964	964	2693	1236	1187	2924							
6	Hopper	177	177	494	151	102	251							
7	Equipment	2176*	2172	15854	2455*	2365	10799							
8	Hopper	145	145	405	144	95	234							
9	Equipment	197	197	550	186	137	337							
10	Hopper	127	127	355	97	48	118							

REMARKS: MDA(dpm/100cm²) for 43-10-1= 13 alpha / 88 Beta
for 43-89-I= 57 alpha / 172 Beta

TECHNICIAN(S) SIGNATURE/DATE: *Amelia* 6/28/04REVIEWER SIGNATURE/DATE: *Don* 7-7-04*W. Clark* 6/28/04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 254 & 256

Page 3 of 5

Contamination Limits: (dpm/100cm ²)		Removable α <u>20K</u>			Removable βγ <u>20K</u>			Total α <u>N/A</u>			Total βγ <u>N/A</u>			
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM βγ Removable	Net CPM βγ Removable	dpm/100cm ² βγ Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM βγ Total	Net CPM βγ Total	dpm/100cm ² βγ Total	mR/hr or μR/hr
26	Equipment	148	148	413	127	78	192							
27		144	144	402	127	78	192							
28		124	124	346	140	91	224							
29		306	306	855	313	264	650							
30		444	444	1240	443	394	970							
31		1070	1070	2989	630	581	1431							
32		48	48	134	88	39	96							
33		408	408	1140	267	218	537							
34	▽	187	187	522	139	90	222							
35	Door	155	155	433	129	80	197							
36	Hood	1987	1987	5550	1729	1680	4138							
37	Equipment	145	145	405	105	56	138							
38	↓	1016	1016	2838	1013	964	2374							
39		147	147	411	113	64	158							
40	▽	599	599	1673	386	337	830							

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: Jon G. [Signature] 6/28/04

W. Clark [Signature] 6/28/04

REVIEWER SIGNATURE/DATE: W. Clark [Signature] 7-7-04

RADIOLOGICAL SURVEY REPORT (Supplement)

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[illegible]

Title: Radiological Monitoring

Procedure: LVI-HP-11

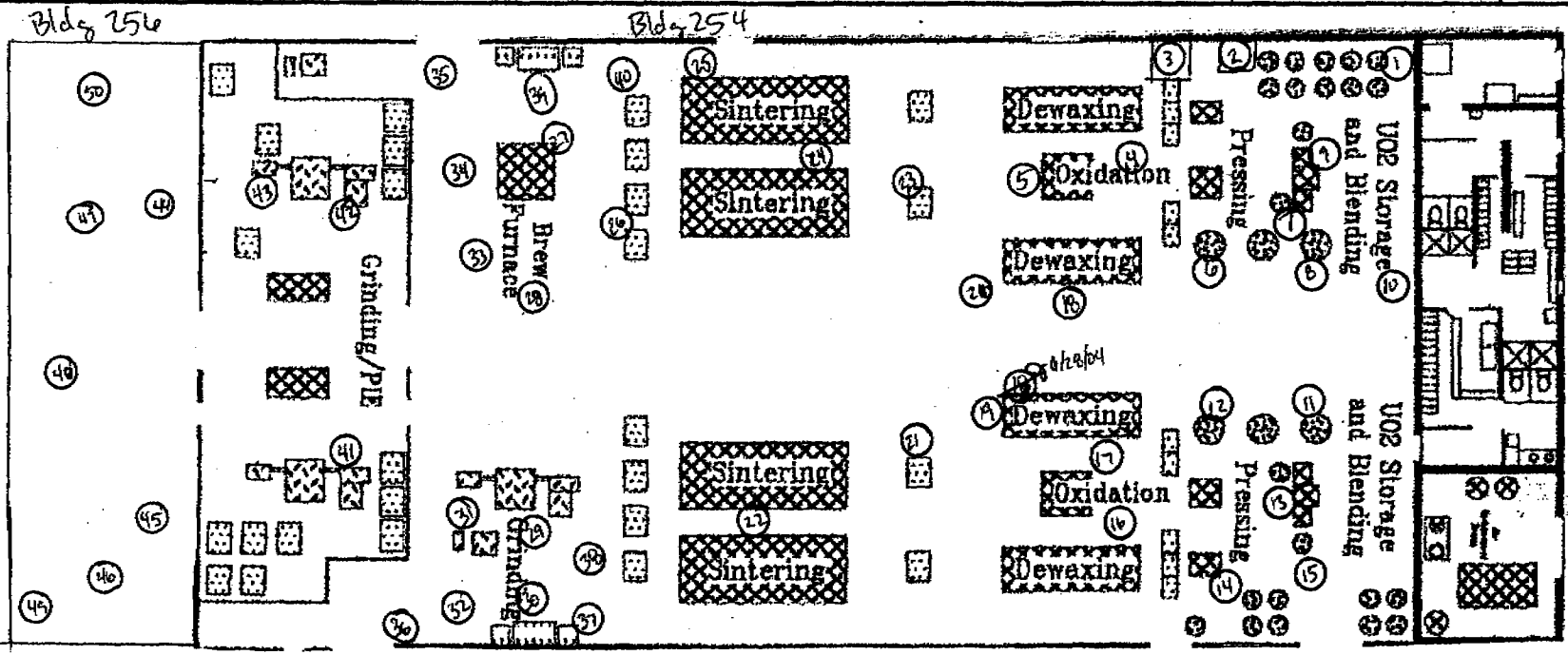
Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: Bldg 254 + 256		RWP: 12-04-024.1	Page 5 of 5
LEGEND: (Fill in blank) <input checked="" type="checkbox"/> = Smear Location <u>N/A</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: 6/28/04	TIME: 10:02
			
REMARKS: N/A			
TECHNICIAN(S) SIGNATURE/DATE: <i>Omig</i> 6/28/04		<i>W. Clark Evans</i> 6/28/04	
REVIEWER SIGNATURE/DATE: <i>[Signature]</i> 7-9-04			

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT

CH-062804-03

SURVEY LOCATION: Bldg 253						RWP: IR-04-024.1				Page 1 of 4				
PURPOSE OF SURVEY: Characterization Survey						DATE: 6/28/04				TIME: 9:55				
Instrument Type(s): (√ if used)		Detector Area (cm ²)	Serial Number:		Cal. Due Date:		Background: (CPM)			Efficiency (%)				
			meter	detector	meter	detector	Alpha (α)	Beta (β)	Alpha (α)	Beta (β)				
<input checked="" type="checkbox"/>	Ludlum 2929/43-10-1	N/A	190615	207928	7/19/04	7/19/04	.2	49	35.8	40.6				
<input checked="" type="checkbox"/>	Ludlum 2360/43-89-B	125	202404	207684	10/8/04	10/8/04	.5	146	15.3	24.5				
<input type="checkbox"/>	Ludlum 2221/44-9	15.5					A							
<input type="checkbox"/>	Micro-R	N/A												
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>		Removable β <u>20K</u>		Total α <u>N/A</u>			Total β <u>N/A</u>				
Sample No.	Description/ Location	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	Gross CPM α	Net CPM α	dpm/100cm ² α	Gross CPM β	Net CPM β	dpm/100cm ² β	mR/hr or μR/hr
1	Equipment Hopper 6/28/04	89	89	249	93	44	108							
2	↓	46	46	128	86	37	91							
3	↓	393	393	1098	421	372	916							
4	Hood	20	20	56	65	16	<MDA							
5	↓	136	136	380	95	46	113							
6	↓	148	148	413	142	93	229							
7	Equipment	15	15	42	56	7	<MDA							
8	↓	173	173	483	161	112	276							
9	Storage Tank	30	30	84	54	5	<MDA							
10	Equipment	595	595	1662	522	473	1165							
REMARKS: MDA(dpm/100cm ²) for 43-10-1= 13 alpha / 88 Beta for 43-89-B= 28 alpha / 193 Beta														
TECHNICIAN(S) SIGNATURE/DATE: <u>Jim S. Lee</u> <u>6/28/04</u> <u>W. Clark Erwin</u> <u>6/28/04</u>														
REVIEWER SIGNATURE/DATE: <u>Det 276</u> <u>7-9-04</u>														

RADIOLOGICAL SURVEY REPORT (Supplement)

SURVEY LOCATION: Bldg 253													Page 2 of 4	
Contamination Limits: (dpm/100cm ²)			Removable α <u>20K</u>			Removable β <u>20K</u>			Total α <u>N/A</u>			Total β <u>N/A</u>		
Sample No.	Description/ Location	Gross CPM α Removable	Net CPM α Removable	dpm/100cm ² α Removable	Gross CPM β Removable	Net CPM β Removable	dpm/100cm ² β Removable	Gross CPM α Total	Net CPM α Total	dpm/100cm ² α Total	Gross CPM β Total	Net CPM β Total	dpm/100cm ² β Total	mR/hr or μR/hr
11	Equipment	44	44	123	73	24	<MDA							
12	Storage Tank	52	52	145	78	29								
13	Equipment	74	74	207	83	34								
14	↓	65	65	182	82	33	✓							
15	Electrical Box	325	325	908	244	195	480							
16	↓	287	287	802	227	178	438							
17	Equipment	68	68	190	88	39	96				A			
18	↓	1117*	1116	7294	1208*	1062	4334			N				
19	↓	80	80	223	77	28	<MDA							
20	↓	1214*	1213	7928	1512*	1366	5576							
21	Box	49	49	137	85	36	89							
22	Equipment	267	267	746	280	231	569							
23	↓	45	45	126	65	16	<MDA							
24	↓	26	26	73	89	40	99							
25	↓	140	140	391	120	71	175							

REMARKS: *Counted on 43-89B

TECHNICIAN(S) SIGNATURE/DATE: On 2/22 / 6/28/04 W. Clark Emue / 6/28/04

REVIEWER SIGNATURE/DATE: Det 2/FB / 3-2-04

Title: Radiological Monitoring

Procedure: LVI-HP-11

Revision: 0

Date: 5/6/04

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RADIOLOGICAL SURVEY REPORT (Map)

SURVEY LOCATION: <u>Bldg 253</u>		RWP: <u>IR-04-024.1</u>	Page 4 of 4
LEGEND: (Fill in blank) <u>⊕</u> = Smear Location <u>N/A</u> = G/A Dose Rate <input type="checkbox"/> mR/hr <input type="checkbox"/> μ R/hr		DATE: <u>6/28/04</u> TIME: <u>0955</u>	

REMARKS: N/A

TECHNICIAN(S) SIGNATURE/DATE: <u>Om 2006</u> <u>1 6/28/04</u> <u>W. Clark Evans</u> <u>6/28/04</u>
REVIEWER SIGNATURE/DATE: <u>[Signature]</u> <u>1 7-9-04</u>

26
 REF ID: A66090
 44-71204-0

NOTE: AREA BKG OUTSIDE HOOD = $0 \text{ gpm } \alpha$, $1320 \text{ gpm } \beta$. AREA BKG WITHIN HOOD = $100 \text{ gpm } \alpha$, $26.2 \text{ k } \beta$.